MACHINERY

Design—Construction—Operation

Volume 42 MAY, 1936 Number 9

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PUBLISHED MONTHLY BY
THE INDUSTRIAL PRESS
148 Lafayette Street New York

ROBERT B. LUCHARS .....*President*
EDGAR A. BECKER..*Vice-pres. and Treasurer*
ERIK OBERG .....*Editor*
FRANKLIN D. JONES ....*Associate Editor*
CHARLES O. HERB .....*Associate Editor*
FREEMAN C. DUSTON ...*Associate Editor*

LONDON: 52-54 High Holborn
PARIS: 15 Rue Bleue

YEARLY SUBSCRIPTION: United States and Canada, $3 (two years, $5); foreign countries, $6. Single copies, 35 cents.
Changes in address must be received by the fifteenth of the month to be effective for the forthcoming issue.
Send old as well as new address.

Entered as second-class mail matter, September, 1894, at the Post Office, New York, N. Y., under the Act of March 3, 1879.
Printed in the United States of America.
Member of A.B.P. Member of A.B.C.

Product Index 130-148

Advertisers Index 150

CIRCULATION 15,253

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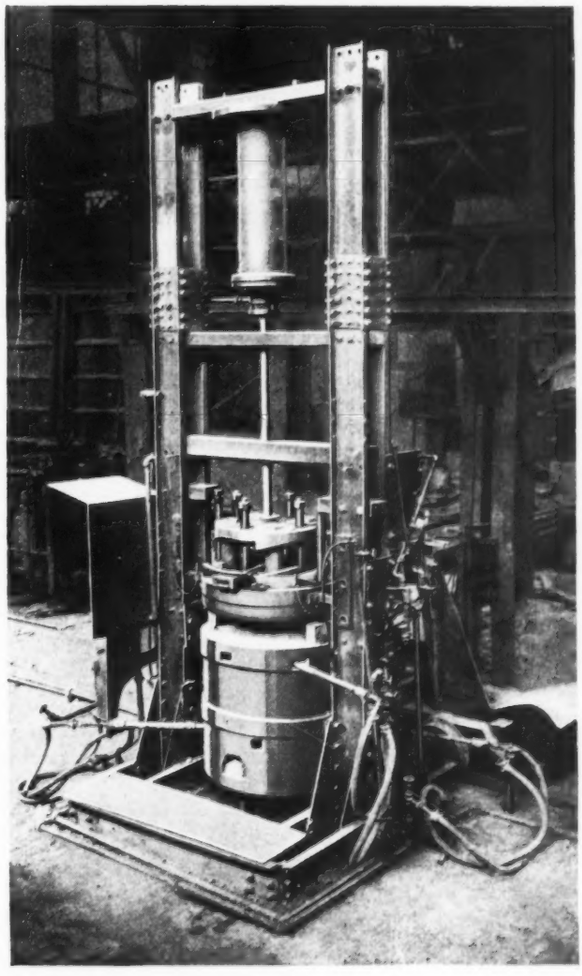
Volume 42 NEW YORK, MAY, 1936 Number 9

Now — Cast-Iron Die-Castings!

By CHARLES O. HERB

DIE-CASTING, up to the present time, has been confined to non-ferrous metals because the various die-casting processes heretofore developed have not been applicable to metals with the high melting temperatures of iron and steel. Die steels are not yet available that will withstand, for any considerable length of time, the heat of molten iron or steel if squirted into the dies by conventional die-casting methods.

Today, however, the die-casting of cast iron is an established fact. It is accomplished by the use of a method originated by Samuel Price Wetherill and developed under his supervision by the Wetherill Engineering Co., Philadelphia, Pa. This process differs considerably from those used in die-casting non-ferrous metals. It constitutes an accomplishment that may have a far-reaching effect on foundry practice. A feature of this process is the use of cast-iron dies with simple liners of cold-rolled steel.



A Remarkable New Development Differing Greatly from Die-Casting Methods Used for Non-Ferrous Metals and from Permanent-Mold Casting Practice

Cast-iron die-castings have the same chemical analysis as sand castings, but their physical properties are considerably improved. Their structure is unusually close grained and uniform throughout, having the appearance of electric furnace iron. The result is that die-castings of 2X foundry iron (ordinary pig iron), as shown by many tests, have an average tensile strength of 53,000 pounds per square inch—approximately 20,000 pounds per square inch more than that of average cast iron. There are no blow-holes due to shrinkage. The castings are not oxidized, as unusual care is taken to prevent oxygen from combining with the molten metal during the die-casting process.

The improvement in the physical properties of cast-iron die-castings is due largely to the close control of the molten metal, the high temperature at which it is cast, and the method of forcing it into the dies. Ordinary 2X foundry iron is

always die-cast at a temperature between 2700 and 2750 degrees F., whereas in the foundry, sand castings of this analysis are generally poured at temperatures ranging from 2400 to 2600 degrees F. Some of the higher grades of cast-iron mixtures are die-cast at temperatures as high as 2950 degrees F.

Another important advantage of cast-iron die-castings is that their surfaces are so smooth as to eliminate the necessity of machining in many instances, and tumbling is never required. The machineability of cast-iron die-castings is such, however, that parts can be readily drilled, threaded, etc., when such operations are required. Die-castings can be produced with much sharper corners than is possible in sand casting, and specified dimensions can be easily held within plus or minus limits of 0.005 inch. By using steel cores, sand can be completely eliminated from cast-iron die-castings. In addition to the advantages mentioned, the die-casting of iron is a much cleaner operation than sand casting.

Iron Castings of Considerable Variety have been Die-Cast

The Wetherill die-casting process is applicable not only to 2X foundry iron, but to every other mixture that has so far been attempted. For instance, castings containing 5 per cent nickel, and others of large silicon content, have been produced. Fig. 1 shows typical cast-iron die-castings made by the new process with the first commercially operated equipment, which is installed at the Alan Wood Steel Co.'s plant in Conshohocken, Pa. All of the castings are of 2X foundry iron produced by that company.

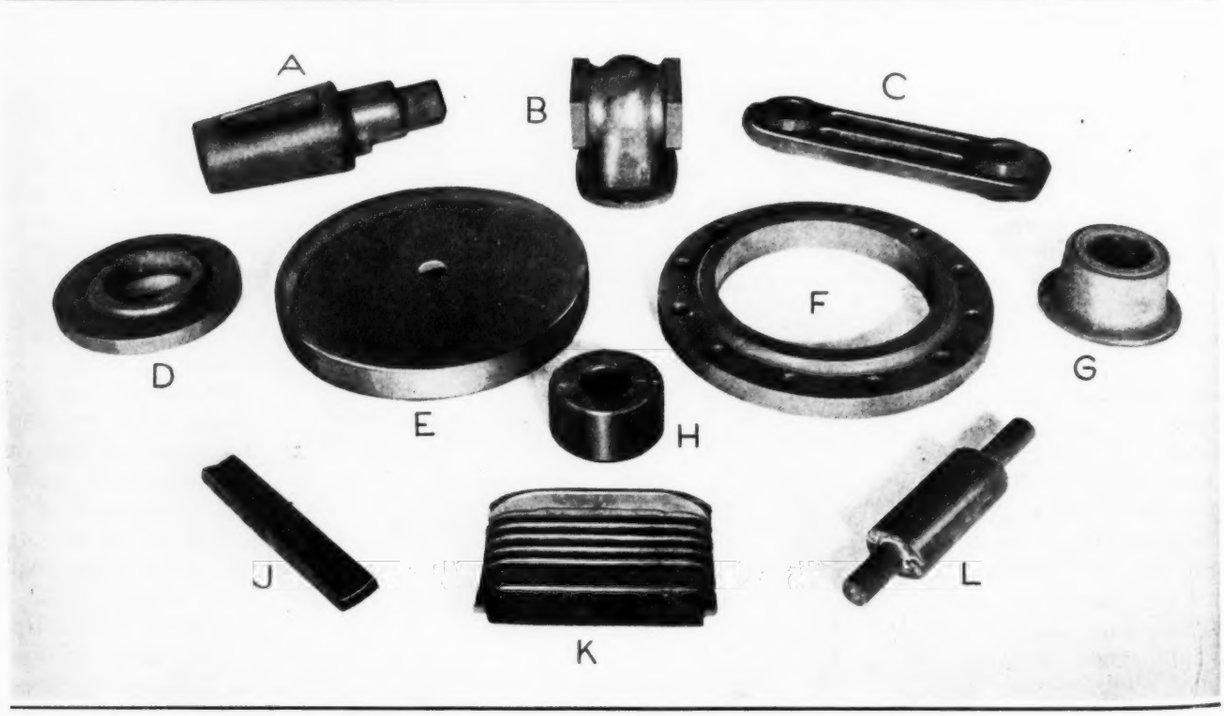
At *A* is a valve stem that is about 14 inches long over all and 5 1/4 inches maximum diameter. This part has a weight of 35 pounds. The large rectangular hole through the tapered section was produced by using two solid steel cores which abutted against each other in the center of the dies.

At *B* is shown a 4-inch valve body, and at *C* a radiator section 17 inches long by 5 inches wide. Sand cores are used for both of these parts to produce the internal openings. Pipe flanges of the type shown at *D* are cast four at a time in a multiple-cavity die. This flange is 9 inches outside diameter and has a 4-inch hole produced by a steel core. It weighs 13 pounds.

The large-diameter disk at *E* is a piston for an air compressor. It measures 15 inches in diameter by 2 inches thick, and weighs 96 pounds. A tapered core produces the center hole. At *F* is a 10- by 16-inch pipe flange weighing 40 pounds. The small holes are drilled in this flange and the threads machined.

The example shown at *G* is of especial interest because it is cast with an insert of seamless steel

Fig. 1. A Number of Iron Castings that have been Produced in Dies by the Application of Low Air Pressure. These Castings Range up to 96 Pounds in Weight



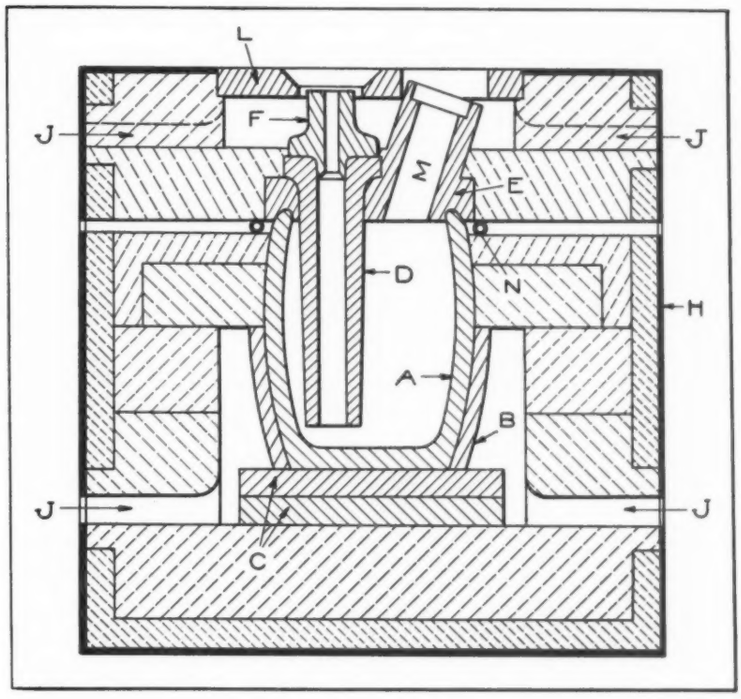


Fig. 2. Cross-section of Crucible in which the Molten Cast Iron is Held at the Casting Temperature, and of the Nozzle through which it is Forced up into the Dies

tubing that is placed in the dies instead of a core. This tubing serves as an outer race for a roller bearing. No machine work is required in order to accommodate the bearing. The part is a flanged pallet wheel of a type used extensively around blast furnaces. It is chilled, in die-casting, to give it long-wearing external surfaces. The wheel is 6 1/2 inches maximum diameter by 3 1/2 inches wide, and weighs 13 pounds. At *H* is shown another pallet wheel without a flange.

The example seen at *J* is a weighing scale bar that must have extremely hard chilled surfaces. In addition, the part is of a curved design and tapers in all directions. The edges must be true and sharp. At *K* is shown a thin ribbed part that is cast with a flat steel insert in one end. Example *L* is a pump rotor produced by die-casting cast iron around a steel shaft.

Equipment that has Made the Die-Casting of Cast Iron Practical Commercially

There are several essential differences between the Wetherill die-casting process for cast iron and the conventional methods of die-casting non-ferrous metals. First, in die-casting cast iron, a pressure of only 20 pounds per square inch is employed to force the metal into the dies. Another important difference is that, instead of using expensive dies made of high-grade alloy steels, this process requires only cast-iron die-blocks fitted with simple liners of cold-rolled steel that are shaped to suit the contour of the pieces to be cast. These liners are relatively inexpensive, and can therefore be provided in quantities for convenient replacement. In cases where the castings are not chilled, they cool slowly with the casting.

The equipment used in die-casting cast iron is of comparatively simple design. It involves the use of a crucible *A*, Fig. 2, which is made of "SynCarb," a product of the Ross Tacony Crucible Co. of Philadelphia. Crucible *A* is seated, as shown at *B*, in a half-crucible made of the same material and on two circular blocks *C*, also of "SynCarb." In the machine shown in the heading illustration the crucible has a capacity for holding 450 pounds of molten metal.

Extending into the crucible is a sleeve *D*, supported by the crucible lid *E*. Fitted into the upper end of the sleeve is a nozzle *F* through which the molten cast iron is forced into the dies. The hole in the nozzle is 1 1/2 inches in diameter. Lid *E* is made of "SynCarb," while sleeve *D* and nozzle *F* are made of silicon carbide. The crucible and its component parts are enclosed in a steel shell *H*, which is 42 inches in diameter by about 41 inches high. Refractory material is filled in between the shell and the crucible unit.

Four openings *J* are provided through the refractory material into which oil or gas burners are inserted for heating the crucible around its lower portion and for heating nozzle *F*. In each die-casting operation, the die gate is seated firmly on the silicon-carbide plate *L*, and thus by heating the nozzle, there is always the assurance that the molten metal will enter the dies at the desired temperature.

The crucible is filled with molten cast iron through the opening *M* in a manner to be described later. Then a 6-inch plug is fitted into the recess in the upper end of this opening, an asbestos gasket being used to insure sealing of the joint. An air line is connected to a fitting on the plug. This air line applies a pressure of 20 pounds per square

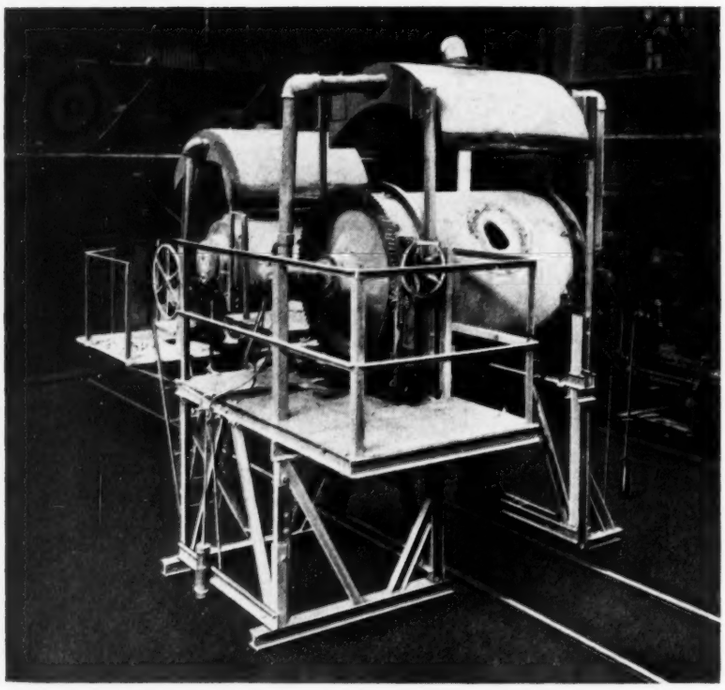


Fig. 3. Rotary Oil-fired Furnace which Supplies Molten Cast Iron in Sufficient Quantity for the Economical Operation of Cast-iron Die-casting Machines

inch directly on the molten metal, forcing it upward through the sleeve *D* and the nozzle *F* into the dies. The size of the pipe connection used is 1 inch.

When pressure is applied on the molten cast iron, some of it tends to escape between the joint formed by the upper edge of crucible *A* and the recess in the bottom side of lid *E*. To prevent this, a 1-inch pipe *N* is provided around the upper end of the crucible. Air at room temperature is constantly blown through this pipe with the result that any molten metal escaping between the crucible and the lid is immediately "frozen," thus sealing the joint against the loss of cast iron.

How the Die-Casting of Cast Iron is Done

The crucible unit just described is installed, as shown in the heading illustration, between two tall structural uprights. Attached to a tie-bar that connects the upper ends of the uprights is an air cylinder. The piston-rod which extends from this cylinder is connected to the upper die of the die set in use, thus providing a means of raising and lowering the dies pneumatically with respect to the crucible unit, and also of withdrawing the top die from the lower die.

Prior to each operation, a 1/4-inch asbestos gasket is placed in seat *L*, Fig. 2. Then the die unit is lowered on this gasket by admitting air into the overhead cylinder, a pressure of 100 pounds per square inch being applied to feed the dies into position and to hold them securely during the operation. Stops control the down position of the dies, so as to guard against damage to the crucible parts. It is the practice to lower the die units until the asbestos gasket between the gate and seat *L* has been compressed about 1/8 inch and the joint at this point thus effectively sealed.

A valve is then opened to admit air through the plug that closes the upper end of opening *M* in the crucible lid. The pressure thus applied causes the molten cast iron to rise through sleeve *D* and nozzle *F* to all points in the die cavity. The cast iron solidifies quickly around the walls of the steel liners that form the die cavity, but remains molten in the center of the casting and in the vicinity of the gate until near the end of the operation. This insures castings that are solid throughout. Upon the release of the air pressure after a predetermined interval, the molten cast iron in the gate and nozzle runs back into sleeve *D* and the crucible. It requires only about forty-five seconds to cast, say, four castings weighing 15 pounds each. The dies are so designed that the castings can be chilled when desired.

One of the secrets of success in the die-casting of cast iron is the heating of nozzle *F* so that the metal does not solidify in the dies close to the gate until after it has solidified at all other points in the die cavity.

While the crucible of the machine illustrated has a capacity for 450 pounds of molten cast iron, it is feasible to cast only about 375 pounds in one operation. Either a single casting or a number of castings can be produced at one time. For economy, at least 50 pounds of metal should be cast in one operation of the machine here shown, and each casting should weigh not less than 5 pounds. In the heading illustration, the machine is shown equipped with a set of dies that casts four pipe flanges of the type illustrated at *D*, Fig. 1, simultaneously.

The Melting Furnace is an Important Adjunct in Cast Iron Die-Casting

One of the important requirements in the economical die-casting of cast iron is a constant supply of molten metal. Whereas in the ordinary foundry the pouring of iron is confined to about two hours in mid-afternoon, after the day has been spent in preparing the molds, the die-casting machine is always ready for the production of castings. The cupola furnace of the ordinary foundry would not meet the requirements of die-casting cast iron.

To supply molten cast iron in sufficient quantity for economical die-casting, the Wetherill Engineering Co. developed a rotary furnace of the comparatively simple construction shown in Fig. 3. This furnace is oil-fired at both ends of the axle. Preheated air is mixed with the oil at the point where it enters the furnace. The air is heated as it passes through the overhead tank, supported above the furnace. This tank is heated when the furnace is first started by allowing heat to escape through the pouring hole, the furnace being positioned with the pouring hole pointed upward and uncovered. About 900 cubic feet of air is supplied to the furnace per minute at a pressure of from 16 to 20 ounces per square inch.

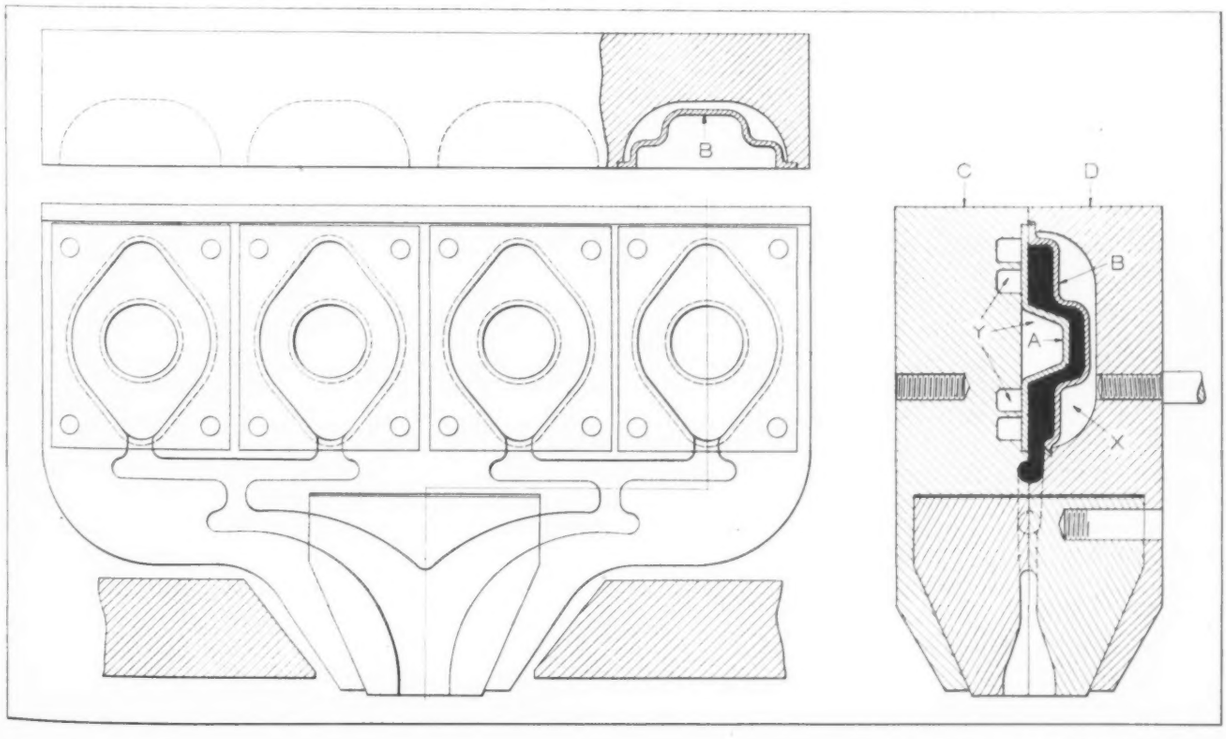
After this furnace has been charged with pig iron or other iron of the desired analysis and the melting operation started, the furnace is revolved once every fifteen minutes. From a cold start, this furnace will supply a ton of 2X foundry iron at a temperature of 2950 degrees F. within two hours. Approximately twenty-four gallons of crude oil are consumed per hour. One of the important structural features of the furnace is a patented lining that is said to be practically indestructible.

Unusual care is taken to prevent oxidation of the molten cast iron as it is transferred from the rotary furnace to the die-casting machine. For this purpose, use is made of a ladle that is identical in design to the unit of the die-casting machine illustrated in Fig. 2. When the metal is emptied into the transfer ladle, it is completely sealed from the atmosphere. The molten cast iron is transferred to the die-casting crucible by applying air to the transfer ladle in the same way that the metal is forced into the die-casting dies. The transfer ladle is mounted on a carriage that runs on tracks extending from the rotary furnace to the die-casting machine. One end of this carriage may be seen in back of the die-casting machine in the heading illustration.

The Basic Principles of Construction of the Dies Used in Die-Casting Cast Iron

The dies used in die-casting cast iron, as already mentioned, are comparatively simple in construction. In many cases, the part is formed within

Fig. 4. A Four-cavity Die Designed for the Production of Small Cast-iron Die-castings. The Drawing Illustrates the Method of Employing Steel Liners to Form the Die Cavities



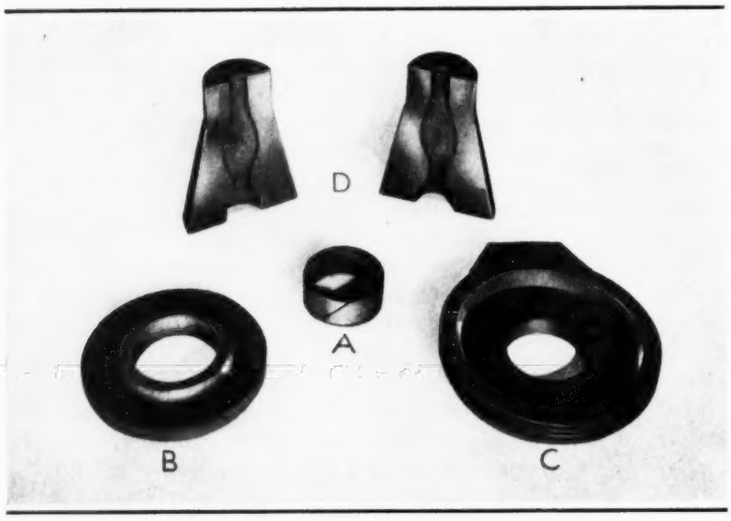


Fig. 5. The Die Parts for Die-casting the Pipe Flange B Consist of Two Split Gate Members D, Two Cast-iron Die-blocks C, a Collapsible Core A, and Two Steel Inserts (Not Shown)

liners of cold-rolled steel, shaped to suit the contour of the part. There is a liner in the upper die and another in the lower die which register together to form a cavity. In Fig. 4, is shown a set of dies that illustrates the basic principle on which the dies used in the Wetherill process are constructed. However, these particular dies were designed for a machine smaller than the one shown in the heading illustration, and they open sidewise instead of vertically. Steel liners *A* and *B*, attached to separate die-blocks *C* and *D*, respectively, form the die cavity. These liners are made of cold-rolled steel 3/16 inch thick. Blocks *C* and *D* are ordinary iron castings. Pockets in the die-blocks, as shown at *X* and *Y*, permit the circulation of cool or preheated air around the steel liners for obtaining chilled or non-chilled castings, as desired.

The steel liners expand and contract freely during the die-casting operation. In cooling, the castings shrink sufficiently to fall from the dies without the aid of ejector devices. Cores made of cold-rolled sheet steel and split crosswise at one point around their periphery, so that they can shrink in diameter as the die-casting cools, are generally used to form holes in the center of parts. Such a core is seen at *A* in Fig. 5. It is used to form the hole in the pipe flange at *B*. At *C* is seen one of the die-blocks in which the pipe flange is cast, but the steel liner is not shown. At *D* are shown the two halves of the die gate.

Core *A* is expanded to its maximum diameter for each die-casting operation by the application of pressure along its upper edge as the dies are closed. When the part shrinks in cooling, the split edges of the core slide along each other, with the result that the diameter of the core is reduced. Dowel-pins insure correct registry of the dies.

Several patents are pending on the equipment used in this die-casting process, and many patents have been issued covering the entire process.

Saving Power in Machine Shop with Two-Motor Drive

By W. F. SCHAPHORST

AN efficient power transmission arrangement for a miscellaneous assortment of machines has been worked out for a New England machine shop. Power is transmitted through a main shaft, which is cut in three places near its center and equipped with friction clutches at each cut. The cuts are about 4 feet apart, which, for convenience, can be referred to as cuts 1, 2, and 3.

Two electric motors drive the shaft. Motor *A*, having twice the capacity of motor *B*, is connected through multi-V belts between couplings 1 and 2 to a clutch-equipped sheave. Motor *B* is likewise connected through V-belts between couplings 2 and 3 to another clutch-equipped sheave.

When all the machines are operated simultaneously, both motors are used, all friction clutches being engaged. When only a few of the machines are in operation, the sheaves are connected and disconnected in the manner most suitable for efficient operation. The unused machines, which are operated through countershafts, are disengaged.

With this equipment, operation at high efficiency is possible nearly all the time, there being three different driving arrangements. Motor *B* is used alone when minimum power is required, and motor *A* is used alone when twice as much power is required. Both motors *A* and *B* are used together when three times as much power as furnished by motor *B* alone is needed. Either motor can be engaged to drive either or both sections of the shaft.

How to Overcome Some Tapping Troubles

By GEORGE W. EMRICK
President, Ettco Tool Co., Brooklyn, N. Y.

TAPPING troubles are common enough. They are met with especially frequently in tapping small holes. A few of the complaints received by a manufacturer of tapping machines and tapping attachments will illustrate the point.

A hardware manufacturer complained that a small tapping machine would not pull 10-32 taps, and a large machine broke them. He concluded that the tapping machines were "no good."

He was in the habit of allowing the operators—nice but inexperienced boys—to hand-grind the taps. Upon inspection, it was found that most of the taps were nicely ground—backward. In fact, it was a fairly good example of left-handed grinding. This method of grinding cost the hardware manufacturer $200 a month. He followed good advice and bought a tap grinder.

Since the grinding of taps is an art, some people pass up tap grinding entirely. Their idea seems to be to run the taps until they break, and then start complaining. They sharpen their drills and their milling cutters, and even their lathe tools, but taps—not necessary.

Yet of all sharp tools a tap should probably be the sharpest. A tap is subjected to two kinds of wear at the same time, abrasive wear and cutting-edge wear. The duller the cutting edge, the greater the abrasive wear; and the greater the abrasive wear, the more trouble you encounter; and the more trouble you encounter, the more worthless is the tapping attachment.

A Few Pointers on Correct Tap Grinding

In speaking of tap grinding, it may be well to mention the rake angle or lip. I am referring to the way in which the inside cutting edge faces toward the center line of the tap. Someone recently complained that his tapping machine would not pull a tap threading aluminum or zinc. An examination of the taps showed that they had no rake. He had ground it off when he thought he was sharpening the tap. A 15-degree rake, and polish in the flutes, made this tap cut into aluminum and zinc like cheese. For soft metals, the flutes must be polished—even to a mirror finish—to prevent welding of the chips to the tap.

For copper, a 15-degree rake is satisfactory; for brass, 5 degrees; and for mild steel, about 10 degrees. In tapping tough steels, experiment. Of equal importance with the rake is the chamfer. A three- or four-thread chamfer is about right. If there is too little chamfer, there is too much work for the tap; if there is too much chamfer, the fine chips will clog.

It seems to me that there are hundreds of mechanics whose idea of perfection is a 100 per cent full thread. The double depth of the thread is carefully figured on a slide-rule (and checked on another slide-rule for all I know), and then a drill is used of exactly the size called for by the figures. Sometimes it is made to order—believe it or not. That they are wrong, 100 per cent wrong, does not matter. A tap or a tapping machine that will not produce that kind of thread is worthless.

Now in very thin metals, one may be able to tap a 100 per cent full thread; but in deep holes, it cannot be done. Metal flows a little or, at least, burrs when tapped. The power required is out of all proportion to the strength of the tap. A 75 per cent thread requires the removal of only half as much metal and takes only half the power, compared with a 100 per cent thread; and why use a 100 per cent thread when even with a 60 per cent thread the screw is most likely to break before the thread strips?

A customer of ours had to tap all the way to the bottom of a blind hole. Accordingly, he ground the end of the tap square, chamfered one thread, found that the tap would stick in the hole, and concluded that the tapping machine had no reverse power. Actually, the tap had formed a chip in the bottom of the hole that virtually riveted it in place. The job can be done by using a three-fluted tap, preferably one with a right-hand spiral flute, grinding the end to a 60-degree center, just like a lathe center, chamfering about two threads, and then tapping.

Another complaint—this time from a real big company—a real big kick. The tapping machine was breaking all the taps that they could buy. Between spoiled work and broken taps, the company might even go into the hands of the receiver if *we* did not do something about it. These people were trying to tap 8-32 threads through 3/8-inch steel, 80 per cent full thread, with a four-fluted tap in one pass. We suggested a simple remedy: Collect all the small four-fluted taps being used and sell them for scrap. Steel scrap is quoted at a fairly high figure right now. Then replace them with two- or three-fluted gun, spiral-point, or chip-driver taps. The "worthless" tapping attachment worked very well after that.

Incidentally, small four-fluted taps are not suitable for machine tapping. There is too little room for chips in a four-fluted tap of small size. When

the chips clog, the taps are too weak to stand the strain, and consequently, they break. Do not overlook the fact that in a small tap like that, about 50 per cent of the area is removed by cutting the flutes. For many purposes, right- and left-hand, spiral-fluted taps would be valuable if they were kept in stock by tap manufacturers.

Then a word about cutting lubrication. In tapping, the cutting edge does not need a coolant. The tap does not run fast enough for that. The lubrication is used to reduce the thread friction. That is why lard oil is such a good tapping lubricant. The less friction there is, the less the abrasive wear on the tap.

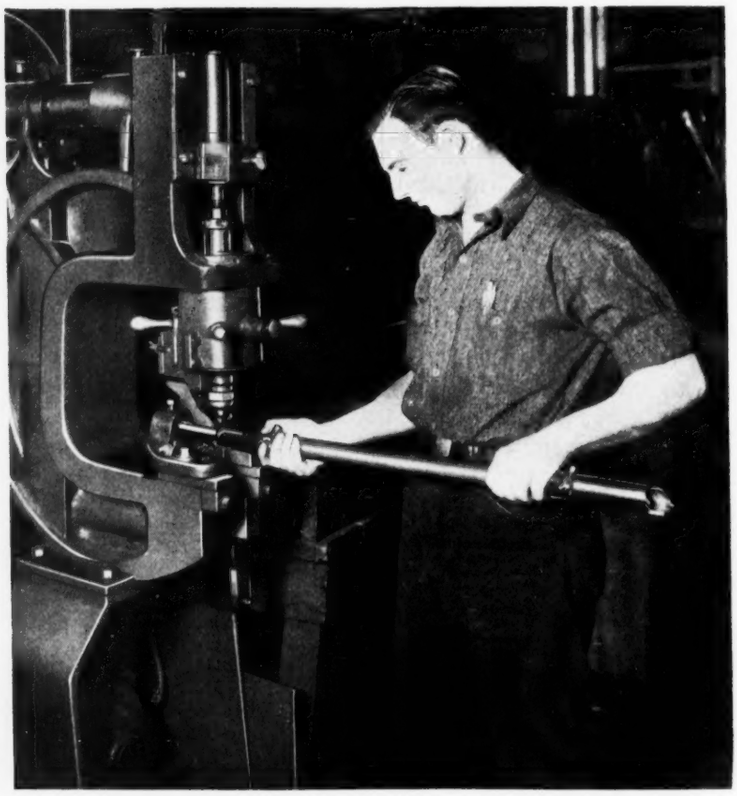
When a tap balks, there is no use in trying to shove it through the work. Either the tapping machine is overloaded or the tap is not right for the job. Always examine the tap first to see whether it is of the right type and properly ground. The right tap under the right conditions, properly lubricated, and used in the right size tapping machine, with the work held by the proper kind of fixture, will do a satisfactory job. As a matter of fact, it is a mystery how a frail tap will stand so much abuse as it is generally subjected to.

And last, but not least, remember that the tap makers know a good deal about taps. It is a good thing to ask their advice once in awhile. A letter sent to the tap manufacturer may often solve a tapping problem that has caused many headaches.

Templets Facilitate Accurate Nibbling of Airplane Struts

THE fuselages of airplanes built by the Curtiss Aeroplane & Motor Co., Inc., Buffalo, N. Y., have a framework constructed of chromium-molybdenum steel tubes welded together at the ends. The welding operations are performed with the tubes clamped in jigs to insure that the structure will be of the required dimensions when completed. The tubes must reach the jigs machined to the correct length and also with their ends finished properly to make the required joints with the other tubes to which they are to be welded.

Nibbling machines are employed to finish the ends of the tubes accurately to length and shape. For each type of tube, a templet is provided which consists of two short lengths of split tubing having an inside diameter slightly larger than the outside diameter of the tube to be nibbled. The two templet tubes are joined by a light bar of square cross-section, which is welded at each end to one of the tubes. The outer end of each templet tube is machined to the contour desired on the fuselage strut. Each templet is made to correspond with a tube that has been fitted in place in a fuselage jig.



Accurate Nibbling of Airplane Fuselage Struts to the Desired Length and Shape is Accomplished by Using Tubular Templets

In the nibbling operation, the tube that is to serve as a fuselage strut is slipped into the templet tubes and clamped by tightening wing-nuts on bolts that pass through lugs on the templet ends. Then both ends of the fuselage tube are nibbled by using the ends of the templet tubes as guides for the nibbling tool.

* * *

In constructing jigs and fixtures by welding together pieces of steel plate and steel blocks, it is suggested that the steel plates and blocks be placed around a wooden templet, arranged to hold them in correct position for welding. In one instance, about 150 jigs were made in this way on a production basis at about one-third the cost that would have been incurred if they had been made from castings.

Modern Equipment for the Drafting-Room

By WALTER W. CLARKE
Hamilton Mfg. Co., Two Rivers, Wis.

Fundamentally, Drafting-Room Practice Has Changed but Little in the Last Fifty Years, but Equipment that was Considered Adequate a Few Years Ago Has Recently Been Greatly Improved

THE efficiency of the draftsman may be impaired any amount up to 50 per cent by (1) lack of fresh air; (2) eye-strain, caused by faulty lighting; (3) nerve fatigue due to noise and loud talking around him; or (4) physical fatigue due to tiring working postures.

The subject of ventilation is vital. An even temperature around 70 degrees F. and an ample supply of fresh air without drafts are necessary. If windows must be open for this, they should be lowered about one inch from the top on the windward side and about two inches at the bottom on the lee side. Newer buildings are usually equipped with automatic ventilation; older buildings may be so equipped without extensive remodeling.

Proper lighting deserves major consideration. Eye-strain is due not only to too little light on the drawing-board (there should be 25 foot-candles of light on the working surface), but also to shadows elsewhere. The light throughout the drafting-room should be as uniform as possible.

For natural light, northern exposure is preferable. Opalescent glass windows, Venetian blinds, or similar devices have never proved entirely satisfactory. Either insufficient or too glaring light on the board is likely to make the draftsman slow, inaccurate, and irritable.

Skylights provide one of the most satisfactory means of daylight illumination. Movable curtains or white muslin on wires may be used to prevent the glare of direct sunlight. Opalescent glass may also be used in the skylight.

When artificial lighting is required, overhead lights should be arranged to provide adequate illumination for the entire room with a minimum of shadow and glare. In addition, each drawing-board should have its individual lighting equipment. Swinging lights, adjustable to any position, are available. A new type of individual lighting, as shown in Fig. 1, has recently been placed on the market. This device consists of a battery of three lights mounted on a rolling bracket at the back of the drawing-board. Each light may be swung in a circle to spread the light over a large area or concentrate it on a small spot.

Noise in the drafting-room should be avoided as much as possible. Loud talking should not be permitted. Discussions should take place in a conference room where there is no danger of disturbing other men. Nerve fatigue reduces the mental powers of the draftsman, slowing him up and reducing his capacity to work out new problems. Noise can be controlled to some extent by the application of sound absorbing materials on the ceiling.

No draftsman can bend over a drawing-board, constantly pressing against the abdomen, without becoming tired. Abdominal and spinal injuries may come from poor seating posture. The height of the drawing-board in relation to the draftsman and his stool, the angle of the board, and the amount of physical effort necessary to work on any part of the drawing are factors to be given consideration. Fig. 2 shows a drafting-board adaptable to any position of the draftsman. He can work

Fig. 1. A New Type of Individual Lighting for the Drawing-board. Lights are Mounted on a Rolling Bracket

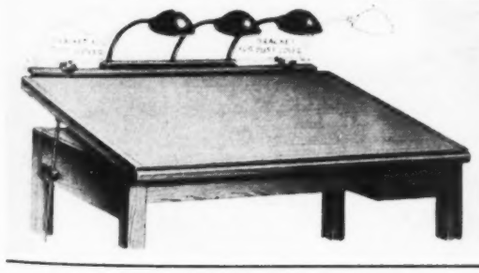


Fig. 2. Board that can be Adapted to any Position of the Draftsman

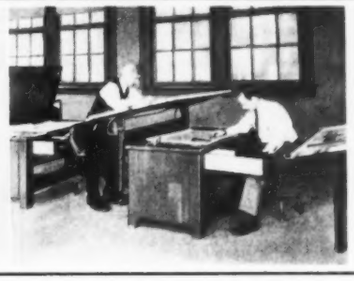


Fig. 3. Improved Adjustable Type of Conventional Drawing Table

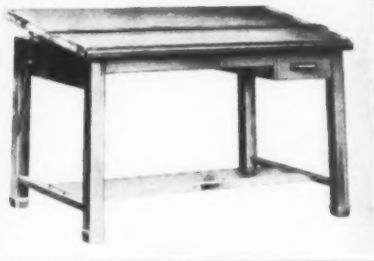


Fig. 4. A Copying Table with Semi-transparent Top of Ground Glass

Fig. 5. Spring-suspended Draftsman's Swivel Chairs

Fig. 6. A Chair that Slides along the Drawing Table

standing or sitting, with a high or a low position of the board, and with the board at any angle.

The more common type of drawing table has also been improved. Fig. 3 shows a design that has a frame of steel, welded and bolted together, with a drawing-board of wood. Cadmium-plated steel cleats on the ends of the drawing-board form a permanent surface for the T-square. These cleats are also designed to take a parallel rule attachment.

Modern drawing tables are also made with an apron or strip of hard wood at the front of the board, a space being left between this strip and the front edge of the board. This space can be used with the apron for long paper to prevent rubbing. Some of the new drawing tables have a deep trough at the front for holding tools—a trough deep enough so that the tools will not spill when the top is tilted.

Most American draftsmen prefer to work with the drawing-board at a slight angle, from 34 to 37 inches above the floor. European draftsmen frequently work with the drawing-board in a vertical position. Parallel rule devices are now counterbalanced, so that they will stay in one position on the board without dropping, even when the board is vertical.

Most drafting-rooms require a copying table with a semi-transparent top of ground glass, lighted from underneath, as shown in Fig. 4. Tracings may be made from old soiled blueprints and drawings on such tables.

Of the types of drafting chairs and stools in use, the draftsman's swivel chair has long been regarded as an aid to comfort. Some prefer a spring-suspended stool of the type shown in Fig. 5. The type shown in Fig. 6 has recently been introduced, combining the rigidity of the stool with the comfort of the swivel chair. This type has an adjustable back and is also adjustable for height. As will be noted, it is mounted on wheels and slides along a steel track on the drawing table. With this type of chair, less aisle space is required, as the chair is never pushed out of place.

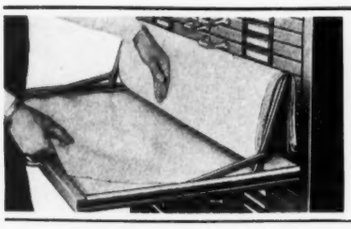
Filing equipment for drafting-rooms has recently received considerable attention. A shallow-drawer file with drawers approximately 1 inch deep inside, each drawer holding about 100 tracings, is shown in Fig. 7. Each drawer, as shown, is equipped with a device that greatly simplifies the removal or refiling of any particular sheet. When the required tracing is located, the sheets above it are folded back over a tracing lifter, permitting the tracing desired to be easily removed or refiled. The shallow-drawer system is intended for active tracings that are in constant use.

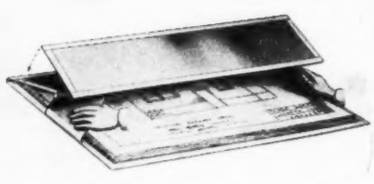
The 2-inch drawing file in general use has also been subject to improvements. One of these consists of a lifting device, as shown in Fig. 8, serving the same purpose as the shallow-drawer lifter, though it is of entirely different design. It has a sliding frame which moves in a channel groove from the front to the back of the drawer. When

Fig. 7. Improved Filing Equipment for Drawings

Fig. 8. Lifting Device Used in 2-inch-deep Drawing File

Fig. 9. Heavy Fiber-board Folders Used for Filing Drawings





the desired tracing is located, the sheets above are folded back and the lifter frame is pushed under them, removing the pressure and weight from the tracing desired. This device can be applied to any drawer 2 inches deep.

Another form of flat drawer filing is the so-called "folder system." Heavy fiber-board folders are used, as shown in Fig. 9. Four of these folders, holding fifty tracings each, are filed in regular 2-inch drawers. The folder has sides that can be raised to support the top and permit tracings to be folded over the top so that any desired sheet can be easily removed. These folders may also be filed in shelf units, sixteen folders to a unit—four on each shelf. In this case, they are usually provided with a "label-holder-pull."

The vertical filing system is considered by many to be the best method of filing drawings. There are many types of vertical files on the market. With some, large envelopes are used, which are held in pockets, as shown in Fig. 10, the pockets being equipped with spiral springs to maintain an even pressure on all parts of the tracings. Another type, Fig. 11, is especially adapted to large sheet filing. This type has twenty-six removable binders holding 100 sheets each, so that a total of 2600 sheets can be accommodated. These files are made to take drawings of different sizes up to 48 by 70 inches.

Vertical files for small-sized sheets are also available, with two or three drawers to a unit, each drawer having pockets similar to the big files. (See Fig. 12, upper view.) For filing drawings in rolls, a steel unit is available, as shown in the lower view of Fig. 12, which is made in various sizes for rolls of small or large diameter, from 30 to 48 inches long. A removable tray is furnished for each roll.

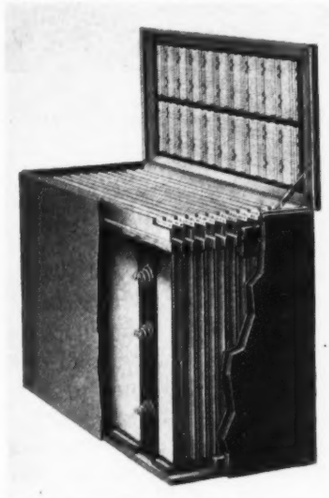


Fig. 10. Vertical Filing System that is Now Frequently Used

Fig. 11. Filing Cabinet Adapted for Large-sized Drawings

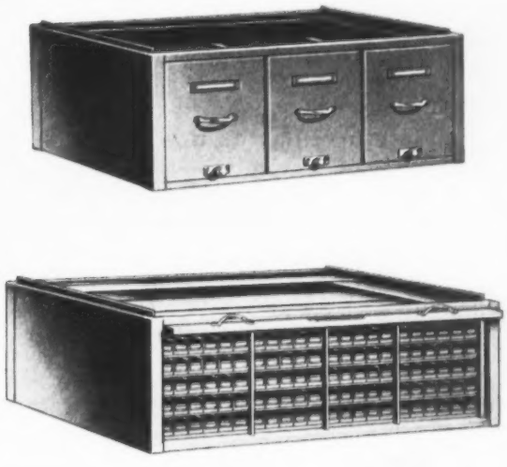


Fig. 12. (Upper View) Vertical File for Small-sized Sheets. (Lower View) Files for Rolls of Drawings

The object of this article is to acquaint the shop executive, engineer, and draftsman with some of the more recent improvements in drafting-room equipment, and to indicate that just as improvements have been made in shop equipment, so improvements have also been made in the mechanical appliances available for the efficient conduct of work in the drafting-room.

* * *

Japanese Machinery Imports Increased in 1935

The Japanese demand for foreign machinery continued at a high level during 1935, according to a report to the Department of Commerce from Carl H. Boehringer of Tokyo, assistant trade commissioner. The machinery imports for 1935 exceeded by 6 per cent those of 1934 and by 44 per cent those of 1933. The imports from the United States amounted to approximately $11,000,000 in 1935, compared with $10,400,000 in 1934, and $5,600,000 in 1933. American machinery represented 30 per cent of Japan's total machinery imports in 1935. Germany and Great Britain are the second and third most important suppliers. Domestic manufacture of machinery has also increased greatly in Japan during recent years.

* * *

One of the largest manufacturers of Diesel aircraft engines has standardized on Stellite welding rod for hard-facing the starting cam, rocker arms, and cams on the camshaft in order to give greatly increased life to these parts.—*Oxy-Acetylene Tips*

Internal and Surface Broaching of Universal Joints

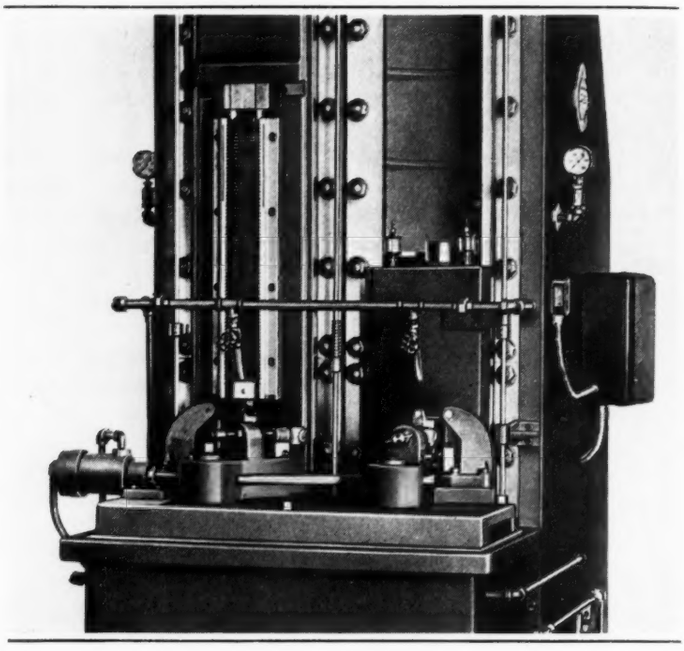


Fig. 1. Hydraulically Operated Fixtures and Duplex Built-up Broaches are Used in Broaching Part Shown in Fig. 2

BROACHING has made its greatest strides in the automobile industry because the huge production schedules of that industry enable full advantage to be taken of the broaching process. For many years, the process was largely confined to finishing splined or irregular-shaped holes, but today it is being increasingly employed for the machining of external surfaces as well. Both types of broaching are performed on the universal-joint sleeve illustrated in Fig. 2.

In the first operation on this part, the seven surfaces *A* are finished simultaneously by the built-up broach shown in Fig. 3. There are five broach sections *B* in this unit. All of them are accurately positioned on a single body casting for easy mounting on the slide of the broaching machine.

The first operation is performed on the double-ram vertical surface broaching machine shown in Fig. 1, which was built by the Lapointe Machine Tool Co., Hudson, Mass. This machine is equipped with automatic hydraulically operated fixtures. The photograph was taken with the left-hand fixture in the loading position, loaded and ready to shift into line with the left-hand broach for its cutting stroke. The right-hand broach is at the bottom of its stroke. The production of this machine is 320 parts per hour. Approximately 0.160 inch of stock is removed from each surface.

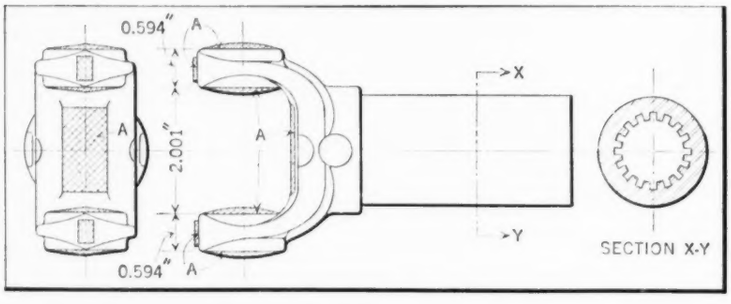


Fig. 2. (Above) Universal-joint Sleeve on which Seven External Surfaces are Broached in One Operation and a Splined Hole in a Second Operation

The internal broaching operation on the universal-joint sleeve produces splines in the hole, as indicated in section *X-Y*, Fig. 2. The hole is drilled in the part immediately after the external broaching operation. The diameter across the tops

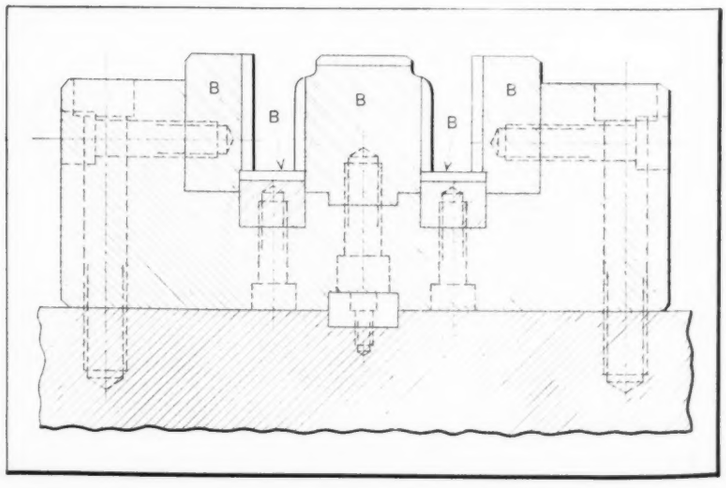


Fig. 3. (Right) One of the Built-up Broaches which Finishes Simultaneously Seven Surfaces of the Universal-joint Sleeve Shown in Fig. 2

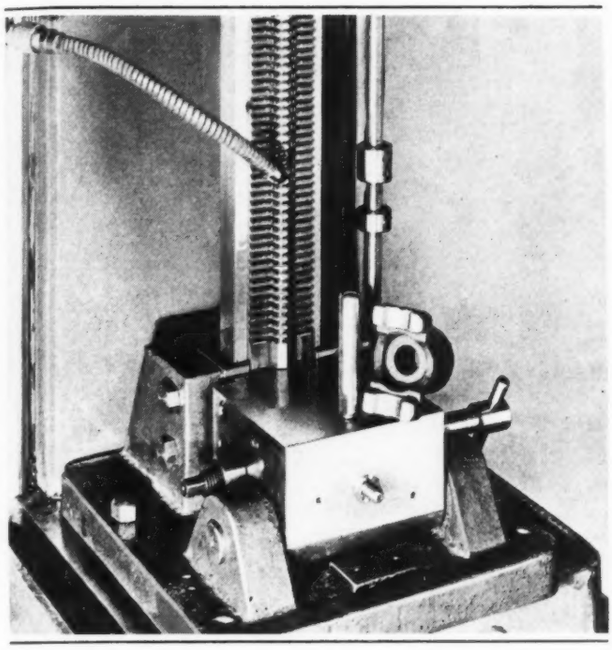


Fig. 4. An Operation in which the Broach is Simply Guided by the Fixture

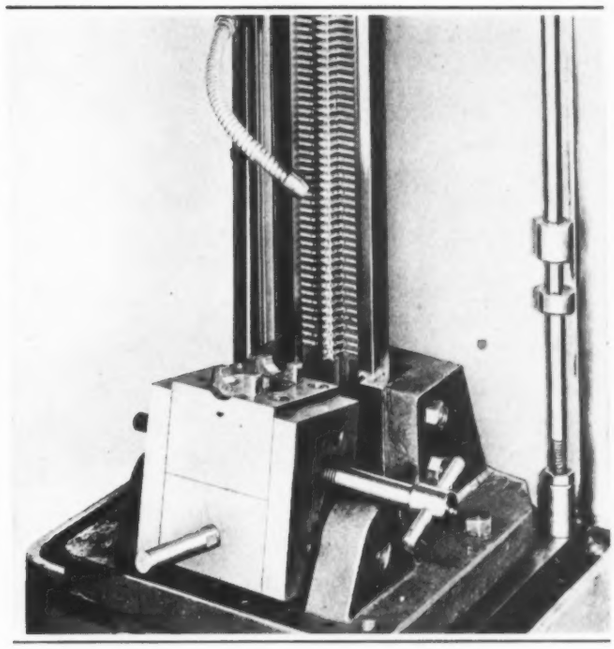


Fig. 5. Open (or Loading) Position of Fixture Shown in Fig. 4

of the splines is held within limits of plus or minus 0.0002 inch, and the concentricity of the splines with the center of the hole is also of vital importance. The broach used for this operation first finishes the hole to the desired diameter and degree of smoothness, and then cuts the sixteen splines. In broaching the splines, the production averages 125 parts an hour. This operation also is performed on a Lapointe machine.

Another universal-joint part is surface-broached with the equipment shown in Figs. 4 and 5. This operation is performed on a general-purpose Lapointe hydraulic press of 6 tons rating. Instead of the broach being mounted on a slide, as is customary on a surface broaching machine, it is simply guided in the fixture.

In Fig. 5, the fixture is shown open with the work in place, while Fig. 4 shows the fixture in the closed position. At *Y*, Fig. 6, is shown a drawing of the part broached, stock to a depth of 3/32 inch being removed, as indicated in solid black. From view *X* it will be seen that the broach is built up of three sections *B*, assembled in a hardened and ground steel body *A*. The production in this operation is at the rate of 250 pieces an hour.

* * *

Although the total value of China's import trade showed a decline of 4 per cent in 1935, compared with the preceding year, industrial machinery imports increased about 20 per cent—from $16,898,000 in 1934 to $20,485,000 in 1935—according to a report of the Department of Commerce.

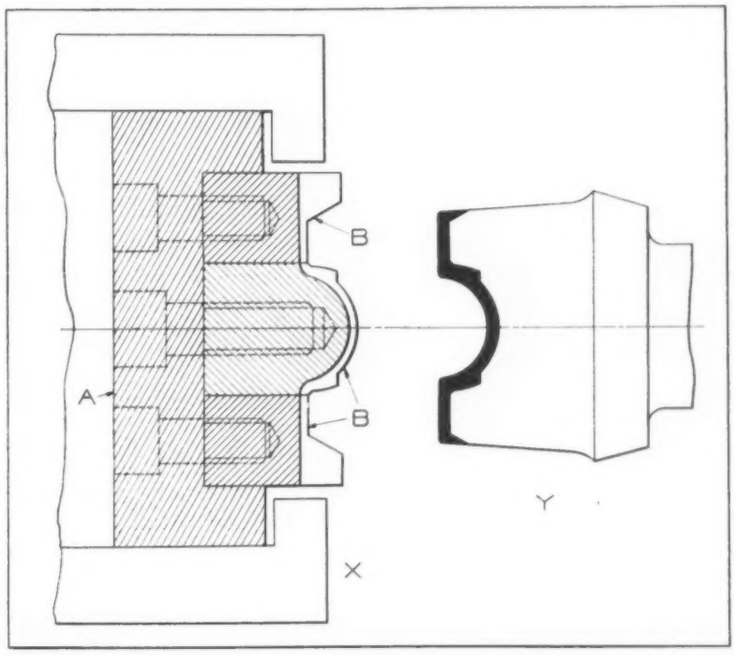


Fig. 6. Drawing Illustrating Work Broached with the Equipment Shown in Figs. 4 and 5, and the Construction of the Built-up Broach

Building Oil-Well by the Use of

Standard Steel Shapes and Plates Joined by Arc Welding Solve Problem of Economical Construction of Varied Sizes and Types of Well Drilling Equipment

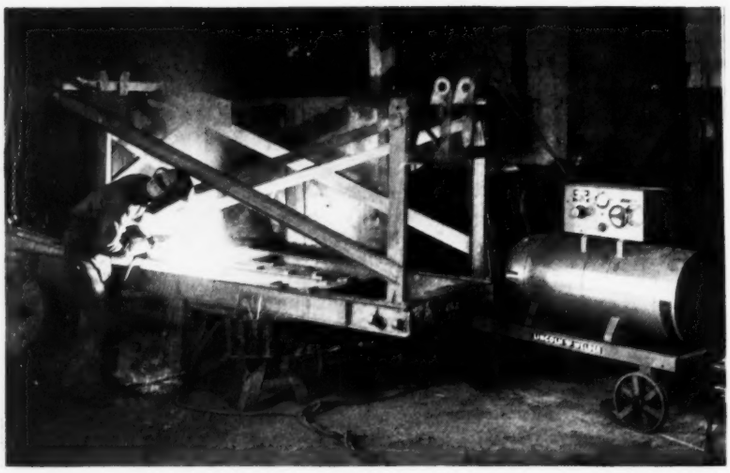


Fig. 1. Constructing the Frame of the Well Drilling Machine Shown in Fig. 2 by Welding

THE simplicity with which standard mill-fabricated materials can be fused directly together without the use of intermediate connecting members has resulted in great economies in building all kinds of machines and mechanical equipment. One of the important features of this construction is the exceptional strength of the metal in the welded joint.

The simplified construction obtained by arc welding has been used to advantage by the Star Drilling Machine Co., Akron, Ohio, in producing well drilling machines of varied sizes and types for both oil and water drilling operations. The machine shown in Fig. 2 is typical of the equipment built by this company. It is built for water-well and blast-hole drilling and for mineral prospecting. It will handle 1600 pounds of tools to a depth of 600 feet.

The frame of this machine was made by simply cutting standard I-beams, angles, plate, and bar stock to the correct sizes and welding them together. The main frame is made of 6-inch I-beams with full-depth I-beam cross-members electrically welded to the web of the main I-beams. This construction provides a frame of great strength and light weight. Fig. 1 shows a frame under construction by arc welding. Bolts are used for assembling parts that must be removed or adjusted while the equipment is in service.

Gear wheels for the well drilling machines vary in size, depending on the capacity of the machine. The one shown in Fig. 3, which is used on the machine illustrated in Fig. 2, is 33 inches in diameter. The first step in making this gear consists of cutting the disk or web from 3/8-inch steel plate. Then five 2-inch angles are welded to one side of the disk in radial positions to form rigid spokes, as shown in Fig. 3. The third step consists of welding bar stock 2 inches thick by 4 inches wide to the outer periphery of the disk to form the blank rim in which the gear teeth are cut. One of the blank wheels is shown in the lower left-hand corner of the illustration. Construction of the gear is then completed by welding the hub in place, as shown. The weight of this arc-welded gear is considerably less than the weight of any gear of cast construction that it would be possible to make.

The bull reel shown in Fig. 4 also indicates how arc welding can be used to simplify design and en-

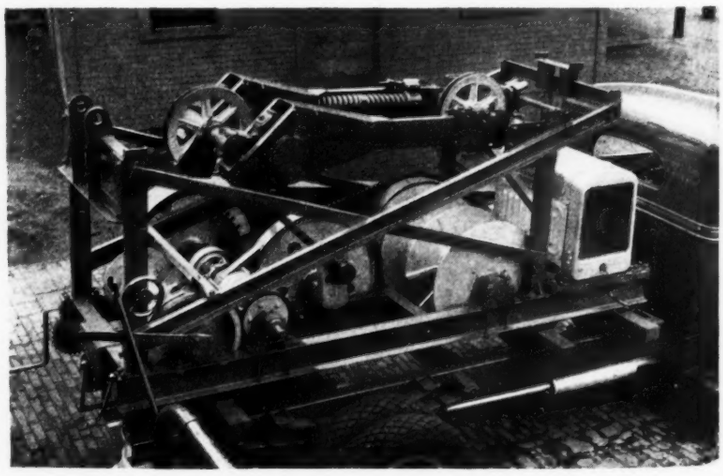


Fig. 2. High-speed Well Drilling Machine that is Constructed by the Use of Arc Welding

Drilling Equipment Arc Welding

By C. M. TAYLOR
Vice-President, Lincoln Electric Co.
Cleveland, Ohio

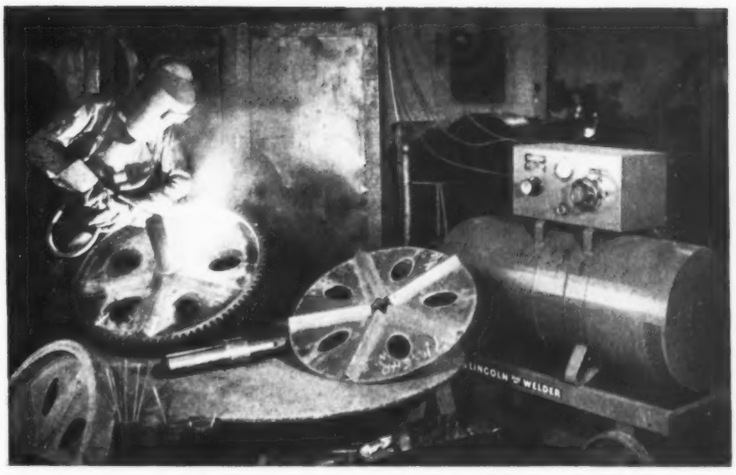


Fig. 3. Welding a Steel Shaft to a Gear Wheel that is of Arc-welded Construction

able machine parts to be produced at low cost. The reel illustrated is 32 inches in diameter over all, and 36 inches from the end plate at the left to the sprocket at the right. The hub is made of a section of 10-inch pipe. The dividers and the brake-drum are welded to this pipe. The dividers are made from 5/16-inch plate. The brake-drum is built up of 1/2-inch plate, which forms the inner disk. A 3/4-inch band, 5 1/2 inches wide, is welded to the outer edge of this disk. Another 3/4-inch plate is welded to the edge of the band and to the shaft, forming the sprocket wheel and the outer support for the brake-drum. Four large hand-holes like those on the brake-drum are cut out of this plate, so that it can be welded to the inside of the brake-drum, as well as to the outside. A 3-inch shaft is welded in place on each end of the reel.

The bull reel on the completed machine shown in Fig. 2 will pull tools from a 600-foot hole at the rate of 400 feet a minute. The sand reel, which is located near the end of the machine, is built in the same manner as the bull reel, the principal difference being that the sand reel is somewhat smaller than the bull reel.

The frame of the wire line "spudder" is made entirely of welded steel plate, 1/4 inch thick. This construction represents a saving of 35 per cent in weight over the frame constructed by methods formerly employed.

A considerable saving in time, labor, and material has been made possible by the use of arc welding in constructing well drilling equipment of the kind illustrated. Many operations necessary with other methods of construction are eliminated. There is practically no patternmaking. As few patterns are required, there is a saving in drafting cost. Also, there is a definite reduction in machining, since the electric arc enables the operator to put the metal required exactly where it is wanted.

* * *

The zealous but unenlightened social reformer and the ignorant politician are alike apt to see conspiracies of the deepest dye behind the operation of those economic laws that make it impossible to extract a quart from a pint.—*Sir James Jean*

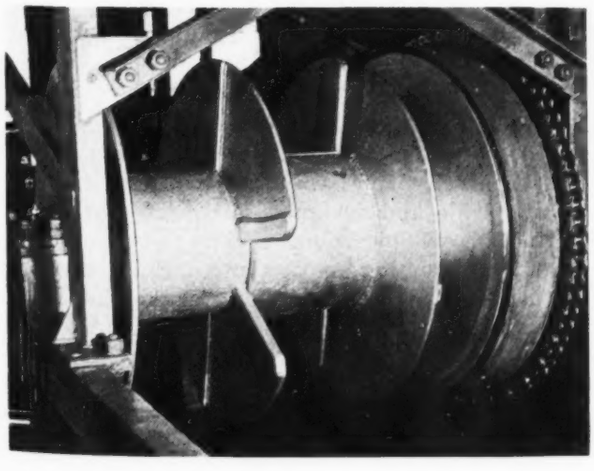


Fig. 4. Reel Made of Steel Plate and Pipe Cut to the Required Shape and Joined by Welding

Engineering News Flashes

The World Over

The Gasoline-from-Coal Industry is Growing Rapidly

On several occasions in the past we have referred to the plants being built in Great Britain for extracting gasoline from coal. The large works of the Imperial Chemical Industries at Billingham-on-Tees are now in operation. By this process, coal is converted into gasoline, 60 per cent by weight of the clean coal processed being turned into what is said to be a high quality gasoline.

In full operation, the plant will produce 54,000,000 gallons of gasoline a year. Some 600,000 tons of coal a year will be consumed, representing, it is stated, the employment of close to 2000 miners, while over 1000 men will be directly employed in the plant, and another 1000 in connection with the company's outside activities. This is an interesting example of how a new engineering development and the improved machinery that goes with it is creating employment, notwithstanding the fact that the uninformed, in high places as well as in labor leader circles, believe that machinery creates unemployment.

Huge Hydrogen-Cooled Generator

What is said to be the largest—as well as one of the first—hydrogen-cooled generators to be built is being constructed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., as a part of a new 50,000 K.W., 3600 revolutions per minute, superposition turbine-generator unit for the New York Edison Co.

New Process of Coating Steel with Aluminum

A new method of coating steel with aluminum has been developed by Professor Colin G. Fink, head of the division of electro-chemistry at Columbia University, New York City. The resulting material combines the high-corrosion resistance of aluminum with the tensile strength of steel. The combination, it is believed, will find uses in fields where either steel or aluminum alone might not be suitable. Sheets, wire, rods, girders, etc., can all be protected by aluminum in this way. According to Professor Fink, the process consists, in principle, of saturating the surface of the steel with hot hydrogen gas before dipping it into a molten aluminum bath. This insures a perfect bond between the steel base and the aluminum coating.

The World's Largest Motor Truck

Motorists in the vicinity of Cardiff, Wales, recently found themselves blocked by a fourteen-wheel truck. On the back of the truck there was this sign: "You are driving behind the world's largest lorry. Go carefully." The truck is said to be capable of carrying a 75-ton load and has been used for transporting heavy electrical equipment. *Industrial Britain* says that no motorist argued about the right of way with this truck.

A Hard-Facing Record

According to *Oxy-Acetylene Tips*, a Michigan paper company, by applying Haynes Stellite to the ends of 2-inch diameter clutch-adjusting screws and to the ends of the rods against which they push, increases the life of these screws and rods from three days to three months. Hard-facing frequently triples and quadruples the life of equipment subjected to wear; but an instance of thirty times the normal length of life is certainly a record.

Another "World's Largest Machine"

The firm of Walmsleys, Ltd., Bury, Lancashire, England, has completed a paper-making machine that is claimed to be the largest and fastest of its kind ever built. The machine weighs 2000 tons and is nearly 500 feet long. It produces newsprint 25 feet wide at the rate of 200 tons every twenty-four hours. Another machine recently built by the firm is 19 feet wide and designed to run at a speed of close to 1200 feet per minute. The paper industry seems to be booming in England. It is reported that a large paper mill is being erected near Warrington, with a main building three-quarters of a mile long. The steam turbines of this plant are said to generate as much power as would be required for the lighting of a town of some 200,000 people.

Colored Roads Aid Night Driving

Experiments with road surfaces of different colors to discover which color is best for night driving are being carried out in Sheffield, England. The experiments are being made on a one-half mile stretch of road on which twelve different colors have been experimented with. The best colors so far tried out have been found to be the pink of rock chips from Leicestershire, England, and light-colored gravel.

Detecting Buried Pipe Lines

A new magnetic detector of great sensitivity and accuracy has been developed by the General Electric Co., Schenectady, N. Y., for locating "lost" or deeply laid pipes. The new detector in actual practice has located pipe lines laid more than forty years ago, which were found as far as 100 feet from their supposed locations, some of them 7 feet deep in the ground. The instrument used for finding them indicated their presence with a limit of accuracy equivalent to one diameter of the pipe.

The detector consists of a surveying compass with an adjustable bar magnet for reducing the "control" effects of the earth's magnetic field, thereby rendering the needle more susceptible to magnetic disturbances produced by the pipe line. Fixed to the compass box and turning with it are two radial fins of high permeability, low hysteresis magnetic material, serving as magnetic antennae. The detector is sensitive to iron or steel pipes and may be used with or without electric current passing through the pipe, although a small current in the pipe makes the search easier and more certain. Because of its great sensitivity, the instrument cannot be used near trolley lines.

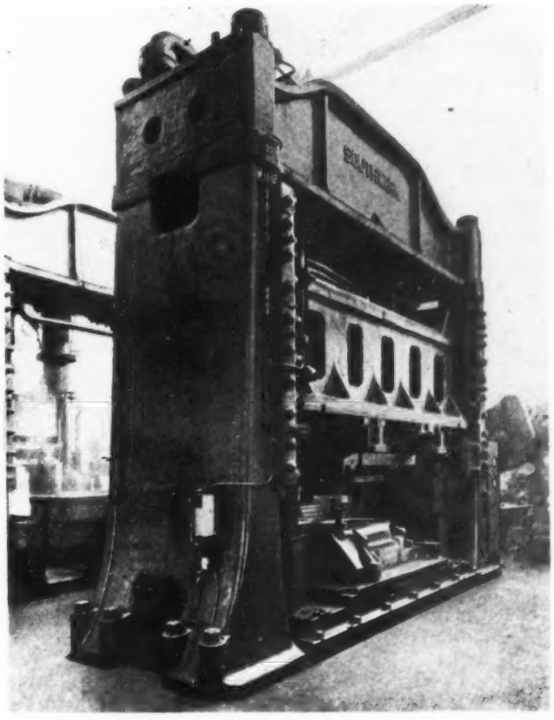
Electric Heat for the Small Garden

"Hobby" gardeners are now offered a convenient way of employing soil heating through a new kit made available by the General Electric Co. With this equipment, there is no need for special wiring or installation expense. The kit is ready to plug into any convenient wiring outlet, after which it is merely necessary to adjust the knob to the desired temperature setting and then let the automatic control function. The kit may be provided either with one or two 60-foot lengths of cable for garden beds or 36 square feet or less for each cable, or with a cable assembly 120 feet in length. Thousands of soil-heating equipments consisting of General Electric thermostats and soil-heating cable have been installed during the last five years by large market gardeners and commercial florists. The present equipment extends the use of this method for forcing growth in the small home-garden.

Britain Reports Record Tool Production

The output of tools in Sheffield last year is stated to be by far the greatest in the history of the city, easily exceeding 1929 and pre-war records. The improvement in demand is more conspicuous in the domestic than in the export market, indicating how thoroughly Great Britain has recovered.

An 830-ton, triple-acting, hydraulic press built for the plant of the Ford Motor Co. at Geelong, Australia, by the Eddystone Shops of the Baldwin-Southwark Corporation. The press is 34 feet high, including the part of the machine that is below the floor level.



It weighs about 35,000 pounds. It has a clear distance of 132 inches between the guides and a vertical clear space 72 inches high. It utilizes direct-acting hydraulic cylinders, which is a relatively new development in triple-action presses

EDITORIAL COMMENT

Re-employment in the nation's manufacturing industries has proceeded at a satisfactory rate. The vast numbers of unemployed reported by the Government are not due to industrial unemployment. The manufacturing industries now employ 84 per cent of the total employed in 1929, or 7,400,000, as compared with 8,800,000 in 1929. In other words, industry has re-employed all but 1,400,000 of what might be termed its share of the ten or twelve million people reported as unemployed.

More significant still is the fact that employment in the country's ten newest and most highly mechanized industries is now 94 per cent of the 1929 figure, according to a compilation by the National Machine Tool Builders' Association. The ten industries are: Electrical machinery; automobiles; rubber tires; petroleum refining; rayon; aluminum manufactures; typewriters; cash registers, adding machines and calculating machines; aircraft; radios and phonographs. MACHINERY has frequently pointed out that highly developed machinery is not the cause of unemployment. On the contrary, in the industries where machinery is developed to the highest degree, employment is also the greatest.

Re-Employment Greatest in Highly Mechanized Industries

To compare present employment figures with those of 1929 does not give the most significant picture, since 1929 represented boom conditions. Take instead as a basis of comparison, the average of the three-year period 1923 to 1925, and then see what machinery has done to employment in the industries most highly mechanized. Even in the depression year 1933, employment in these ten industries was 22 per cent *higher* than ten years previously, and in December, 1935, it was 69 per cent higher. It rather looks as if highly improved machinery *increases* employment. Senators and Congressmen please take notice.

We recently heard Raymond L. Collier, secretary of the Steel Founders' Society of America, make some well founded remarks on the policy of "hand-to-mouth" buying that many manufacturing plants have adopted in the last few years. While Mr. Collier referred especially to steel castings, his remarks may well be applied to almost any kind of materials or supplies used in manufacturing. By the policy of hand-to-mouth buying, inventories have been reduced to a minimum, in order not to tie up working capital. This policy works satisfactorily in a declining market.

Hand-to-Mouth Buying May Become Costly in a Rising Market

But the policy of buying to meet immediate needs only, has its weak points in a rising market. Investments in inventories are likely to be profitable under such conditions. They are also considered by many a suitable insurance against inflation. If materials or supplies are placed in stock at the present time at, say, $100 per unit, and their price increases to $120 by the time they are used in the manufacture of goods, the advantage is obvious. Furthermore, quantity discounts on many purchases may represent appreciable savings.

With wages, taxes, and prices of raw materials on the increase, hand-to-mouth buying, therefore, is likely to prove costly for some time to come. Every business has its own problems and must, of course, decide its course in accordance with individual requirements; but, generally speaking, the time has come when it is well to consider carefully whether money is not being lost by too strict adherence to the policy of hand-to-mouth buying.

A shop executive in the automotive industry recently emphasized the difficulty met with in convincing the workers in the plant that standing on a concrete floor has no harmful effects. It is quite generally believed that it is bad to stand constantly on a concrete floor, and frequently wooden boards and platforms are provided in front of the machines. These wooden platforms are usually unsanitary and dangerous. They collect dirt and grease and are certainly far from satisfactory.

Are Concrete Floors as Objectionable as Alleged?

Concrete floors are not so objectionable as is generally thought. Several doctors in charge of shop clinics agree that they have never found any bad effects from them.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Two-Purpose Intermittent Drive Mechanism

By VINCENT WAITKUS, Jr.

The mechanism shown in Fig. 1 has the component parts so arranged that it can be used for two distinct purposes. In the application to be described first, the continuously rotating shaft *A* transmits an intermittent rotating movement to the shaft *B*. In disk *C* fastened to shaft *A*, is a pin *D* which contacts with the surface of the internal cam on the combination cam and lever *E*.

Lever *E* is pivoted on shaft *B* and is provided with a lug to which the spring pawl *F* is fastened. Two spring pawls are shown, but one or more may be provided, depending upon the movements imparted to lever *E*, as will be explained later.

The enlarged view, Fig. 2, illustrates the method of producing the oscillations in lever *E*. The movement of pin *D* on the internal cam surface of lever *E* forces the lever to one side until a point is reached, as shown by the dotted lines, where pin *D* passes over the ridge or shoulder in the cam surface. The location of pin *D* inside the cam produces a positive motion in the lever and eliminates the use of any form of spring.

If the stroke of the lever movement is sufficient to produce a movement in the pawl equivalent to one-half the pitch of the teeth in the gear or ratchet wheel *G*, then two spring pawls are required, as illustrated, the inner pawl being shorter by one-half the pitch of the teeth.

If the lever stroke is equivalent to one-third of the tooth pitch, three spring pawls are required, each being shorter than the next outer one by one-third the tooth pitch. In this manner, the number of intermittent movements of gear *G* can be varied to conform with requirements.

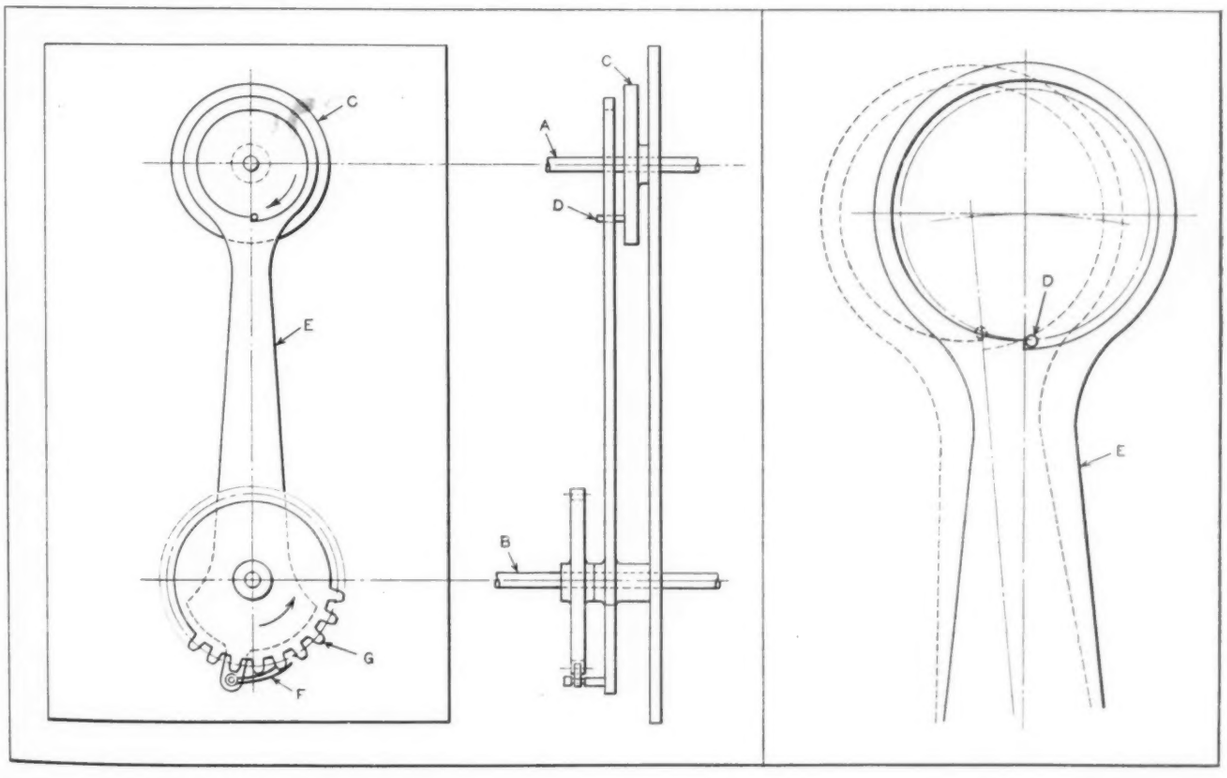
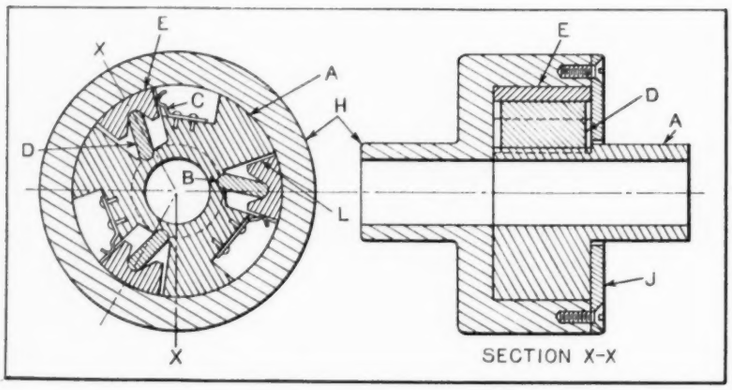


Fig. 1. Mechanism for Transmitting Intermittent Motion from A to B or from B to A

Fig. 2. Enlarged View of Members D and E, Fig. 1



Over-running Clutch with Toggle-actuated Shoes

In the second application, shaft *B* is driven continuously in a counter-clockwise direction. Through a friction clutch arrangement (not shown) shaft *B* drives shaft *A* in a clockwise direction. Lever *E* stops the rotation of shaft *A* at predetermined intervals, so that shaft *A* rotates intermittently.

Referring to Fig. 2, assume that pin *D* has reached the position shown by the dotted lines and that shaft *A* is being driven by shaft *B* through the friction clutch drive. As shaft *A* with its disk *C* revolves, pin *D* acts on the cam surface of lever *E*, causing it to pivot about shaft *B* in a direction opposite to that of the rotation of shaft *B* until pin *D* reaches its lowest position, as shown by the full lines in both Figs. 1 and 2. At this point the pin comes in contact with the shoulder on lever *E* and rotation of shaft *A* is stopped, due to the engagement of pawl *F* with the teeth on gear *G*.

It should be mentioned here that the drive between shafts *B* and *A* is designed to rotate shaft *A* at a faster speed than the driving shaft *B*. Slippage of the friction clutch in the drive from *B* to *A* occurs, of course, at this point and continues until shaft *B*, rotating in a counter-clockwise direction and carrying the spring pawls *F* around with it, causes lever *E* to pivot or swing around to the position shown by the dotted lines in Fig. 2. Pin *D* is released when contact with the shoulder on lever *E* is made at this point, and the cycle is repeated as described.

Over-Running Clutch

By JOHN A. HONEGGER

An over-running clutch employing the toggle joint principle for obtaining the required locking action is shown in the accompanying illustration. It consists of the spider *A* having three milled slots spaced 120 degrees apart, the outer casing *H*, and the toggle levers *D*. At points *B*, which are slightly offset from the center lines of the slots, are milled semicircular recesses which act as seats for the toggle levers *D*.

The shoes *E* are made slightly smaller than the width of the slots and have an outside diameter equal to the diameter of the spider *A*. Seats are milled in the rear sides of the shoes for the toggle levers *D*. The flat springs *C*, fastened in the slots in the spider, tend to keep the shoes *E* in contact with the inside of the outer casing *H*. A retainer plate *J*, held in place by screws, keeps the members of the clutch assembled.

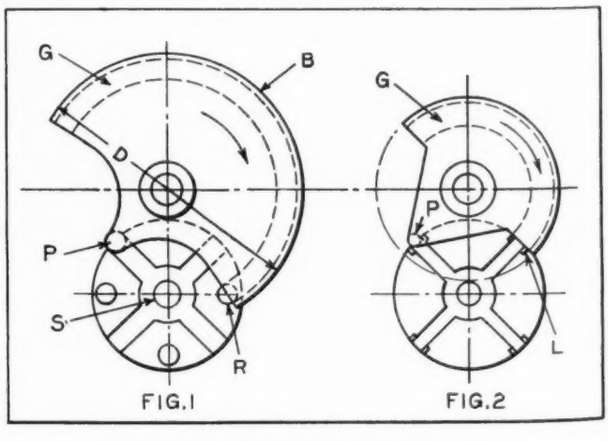
The operation of the clutch is similar to that of any free-wheeling clutch. The toggle levers *D* are set at as slight an angle as possible, making due allowance for wear on the shoes *E*. After the shoes become worn, the faces *L* are machined or cut back. When the shoes have been cut back so that the toggles *D* become ineffective they are replaced.

Modified Geneva Movement of Improved Design

By ADOLPH MOSES

The modified Geneva movement shown in Fig. 1, illustrated and described in MACHINERY'S book "Ingenious Mechanisms for Designers and Inventors," provides positive locking of the driven member between the indexing movements. The locking is accomplished by having one or two of the rollers *R* engage the annular groove *G*. The roller *P*, carried by the driving disk *B*, is shown about to leave its slot, having completed the indexing of shaft *S*. The roller *R*, shown entering the groove *G*, serves to lock the disk and shaft *S* until the next indexing movement.

This mechanism has the disadvantage of being rather large. Also, roller *R* is so located that the driver *B* must be of such a large diameter *D* that it would interfere with the shaft *S* if it were extended through the driven wheel. This construc-



Examples of Modified Geneva Movements

tion necessitates placing the driven wheel at the end of the shaft, thus preventing the use of an outboard bearing.

These objections have been overcome by the arrangement shown in Fig. 2, in which the locking of the driven disk is accomplished by lugs *L* which extend beyond the radial grooves of the driven member, so that they are engaged by the groove *G* in the driving member. Rollers can be substituted for the lugs *L*, but they are more expensive. It will be noted that the same diameter of driven wheel in the mechanism shown in Fig. 2 requires a driver of much smaller diameter than the mechanism shown in Fig. 1. It will be noted also that the lugs *L* are located in the most effective positions for locking the driven member, whereas the rollers *R* are so positioned that they lose about 30 per cent of their effectiveness. In other words, a given clearance between the locking members will permit more play or looseness in the case of the mechanism shown in Fig. 1. The loads on the locking pin required to resist a given torque will be about 50 per cent greater than on the lugs *L*.

Another advantage of the improved mechanism is that it is easier to make, especially in shops not accustomed to handling precision work, because the groove *G* extends for exactly half the driver area, or through an angle of 180 degrees, while the groove *G* of the other mechanism is somewhat over 180 degrees and must be carefully calculated and laid out. The rollers *R* must not only be accurately spaced between the grooves of the star wheel of the driven member, but they must also be accurately located at the correct distance from shaft *S*. On the other hand, the lugs *L*, Fig. 2, can be easily centered on the slots in the star wheel, and their location from the center is also easily accomplished.

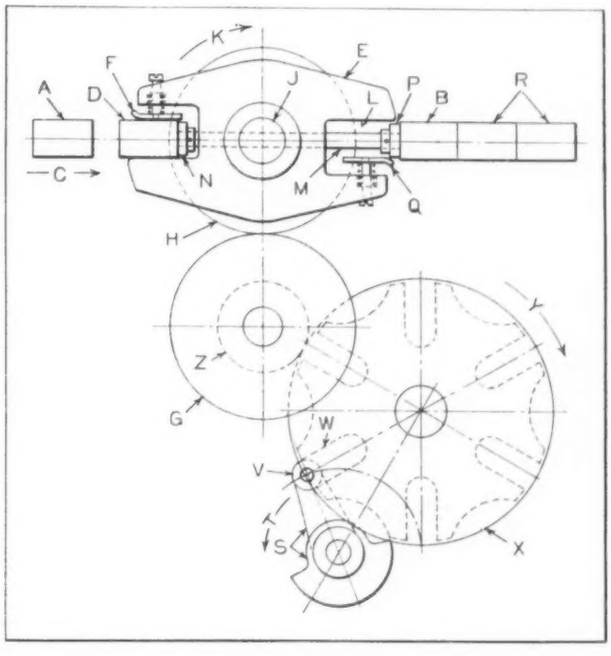
Still another advantage of the mechanism shown in Fig. 2 is that by cutting away a little material on the star wheel and modifying the arm of the driver that carries the roller *P*, either the driver or the driven disk can be assembled or dismantled without disturbing its mating part by sliding one part past the other.

Work-Reversing Mechanism

By F. H. MAYOH

Many types of automatic machines must be provided with means for turning over or reversing the position of the work at some point during its progress through the machine. This is accomplished very effectively in one case by the mechanism shown in the accompanying illustration, by means of which the work at *A* is turned over and transferred to position *B*. To accomplish this, the work *A* is fed in the direction indicated by arrow *C* to the position *D* in the reversing mechanism *E*. A plate *F* in this mechanism holds the work by means of pressure applied by two springs, only one of which can be seen in the illustration. Attached to the reversing mechanism is a gear *H* which is mounted on a shaft *J*.

The Geneva mechanism shown below gear *H* turns the entire unit through an angle of 180 degrees in the direction indicated by arrow *K* each time it functions. This movement transfers the work from position *D* to *L*. When the next piece is pushed into position *D*, it comes in contact with pad *N* on plunger *M*, pushing it to the right. Thus the pad *P* on the other end of the plunger pushes the work into the position indicated at *B*. This action is repeated at each cycle of the machine causing the work, which has been reversed, to be pushed along, as shown at *B* and *R*. The indexing is accomplished by means of a Geneva movement,



Mechanism for Reversing Work D and Transferring it to Position B

in which the combination lever and locking segment *S* revolves in the direction indicated by arrow *T* through one complete revolution for each 180-degree indexing movement of member *E*.

The roll *V*, at each revolution, engages one of the slots *W* in the plate, causing the large spur gear *X* to revolve in the direction indicated by arrow *Y* through one-sixth of a revolution. The speed ratio between gear *Z* and gear *X* is three to one. Thus gear *G* is revolved anti-clockwise one-half revolution, causing gear *H* to revolve one-half revolution in the direction indicated by arrow *K*. This completes one cycle in the operation of the automatic machine.

* * *

In this era of governmental spending, why not spend a little on trade school shop equipment?

Resistance Welding in Refrigerator Manufacture

Newly Developed Equipment and Methods Used for Flash- and Seam-Welding Refrigerator Cases and Liners

By M. L. ECKMAN, Chief Engineer
Federal Machine & Welder Co.
Warren, Ohio

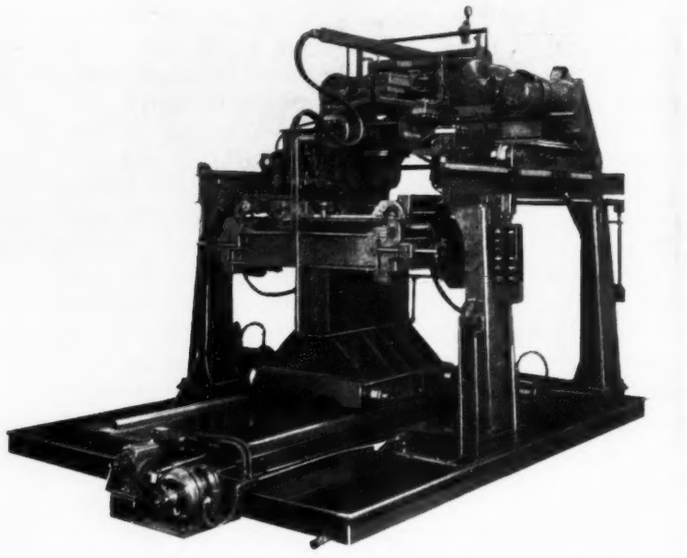


Fig. 1. A Machine Designed for Seam-welding Inner Linings of Refrigerators

SEVERAL well-known manufacturers of automatic refrigerators now use resistance flash welding in the fabrication of the outer cases and seam welding in the fabrication of the liners or food compartments. This application of the welding process has a number of advantages: It is possible to obtain smooth surfaces without any overlapping joints where particles of food may lodge—in other words, cleanliness is promoted; the enameling process is facilitated because there is no porosity where the metal is joined, to cause pin-holes or bubbles; joints as strong as the parent metal can be produced at high speed and low cost; and last, but not least, welding makes it possible to adopt a design that will please the woman customer.

Fig. 2 shows diagrammatically the principle involved in resistance flash welding. The metal sheets to be welded together are "butted" edge to edge in the welding machine without overlapping or buckling. Fig. 3 shows this principle applied to the welding of the outer case of a refrigerator. This case consists of a U-shaped center section and two side members accurately formed in large presses from 18-gage sheet metal. Preparatory to welding, the edges are trimmed in presses to the correct dimensions. After welding and stripping, there is no projection or bulge at the weld.

A Federal welding machine is used for welding these refrigerator cases. One operator and a helper produce forty cases an hour on this machine. The operation, briefly, is as follows: The center section of the case (see Fig. 3) is placed in the formed dies with the welding edge against a removable gage which is held firmly in the machine by air pressure. Clamping arms are lowered and an aluminum latch is thrown up into the clamping position. This latch is made of aluminum to make it easy to operate. It is also spring counterbalanced.

The side members are similarly placed in position and clamped by a toggle action, operated by 10-inch air cylinders. The clamping is controlled by hand-operated valves. The operator steps on a foot-pedal, pulling back a removable platen far enough to remove the gage from between the edges of the work. Everything is now ready for welding.

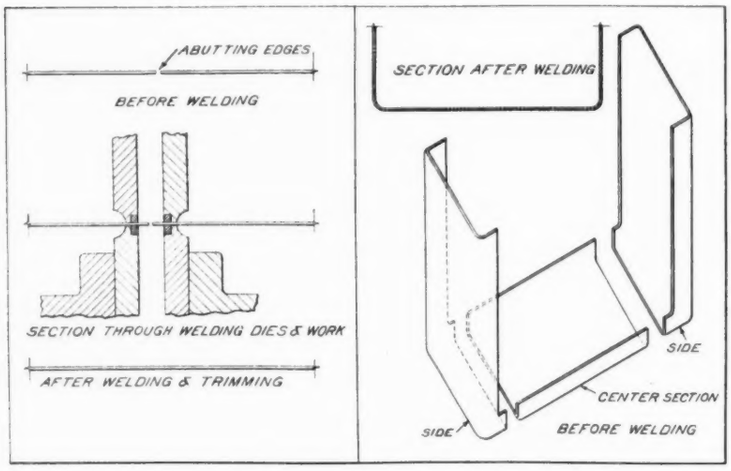


Fig. 2. (Left) Principle Involved in Resistance Flash Welding
Fig. 3. (Right) Parts of Outer Case of a Refrigerator to be Welded

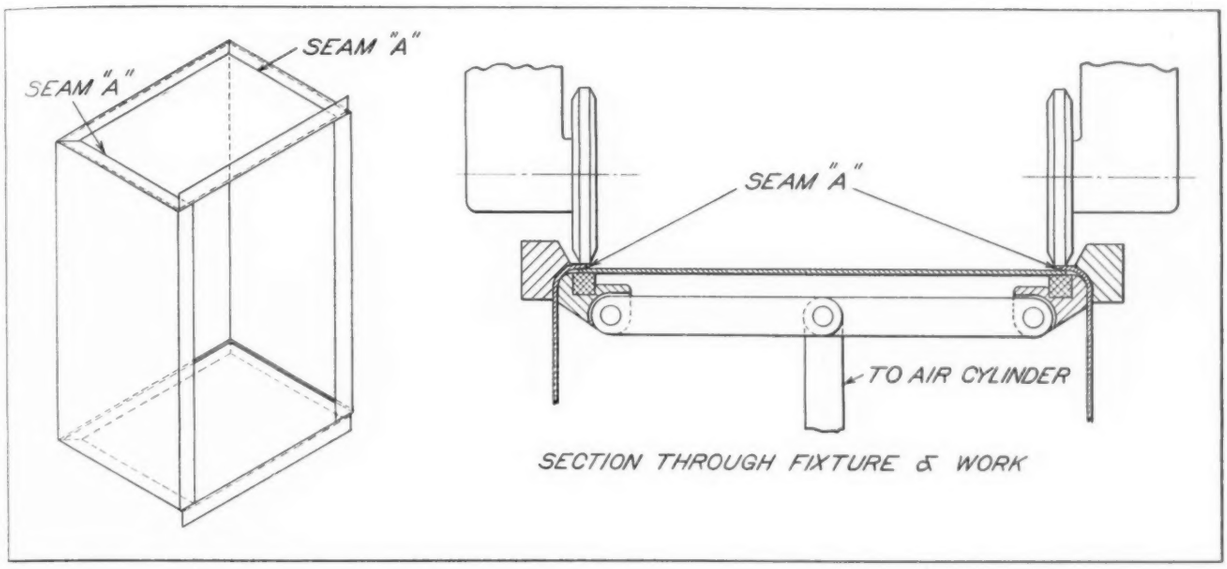


Fig. 4. Diagrammatic View of the Inner Liner of a Refrigerator and Section Showing How Seam Welding is Applied to It

A starting button is pressed to start the machine, and from this point on, the operation is entirely automatic. The flashing and upsetting, the cutting off of the welding current, and the stopping of the motor in the right position is a matter of from four to seven seconds. The weld is now complete.

At the end of the welding operation, both hand air valves are reversed, thereby unclamping the work, the aluminum latches are dropped, the arms raised, and the completed case removed. The operator steps on the foot-pedal, pulling back the platen, and inserts the gage. The machine is now ready for another cycle.

On account of the construction of the units, it is not always practicable to use the flash-welding method. The inner liner or food compartment cabinet is a case in point. Fig. 4 shows a diagrammatic view of this cabinet, which is a rectangular box. It is first shaped, with the top, bottom, and front open. A flanged top and bottom are provided, which are resistance seam-welded to the other parts of the liner.

The seam welding is done by holding the parts rigidly in a fixture with dies to conduct the current. The sheets to be welded overlap about 1/32 inch. Over the overlapping edges is passed a roller electrode with accurately controlled current and pressure. In this way, a smooth joint, rolled down to the equivalent of one thickness of metal, is obtained. The arrangement is diagrammatically illustrated to the right in Fig. 4.

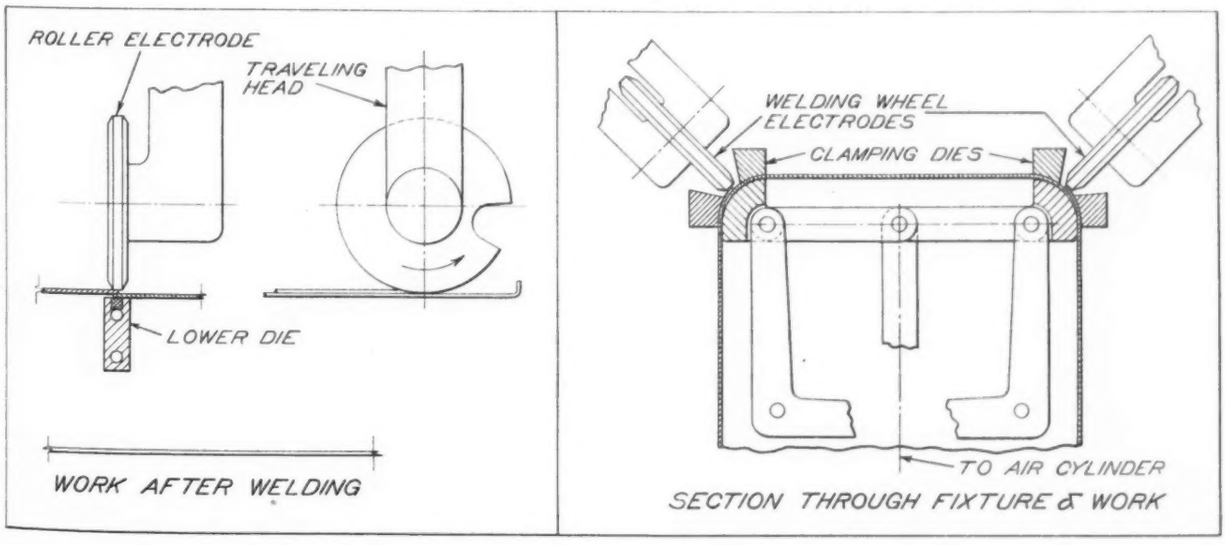


Fig. 5. (Left) Arrangement when a Seam Must Start or Stop against a Flange
Fig. 6. (Right) How Welds are Made with the Seam on a Curved Corner

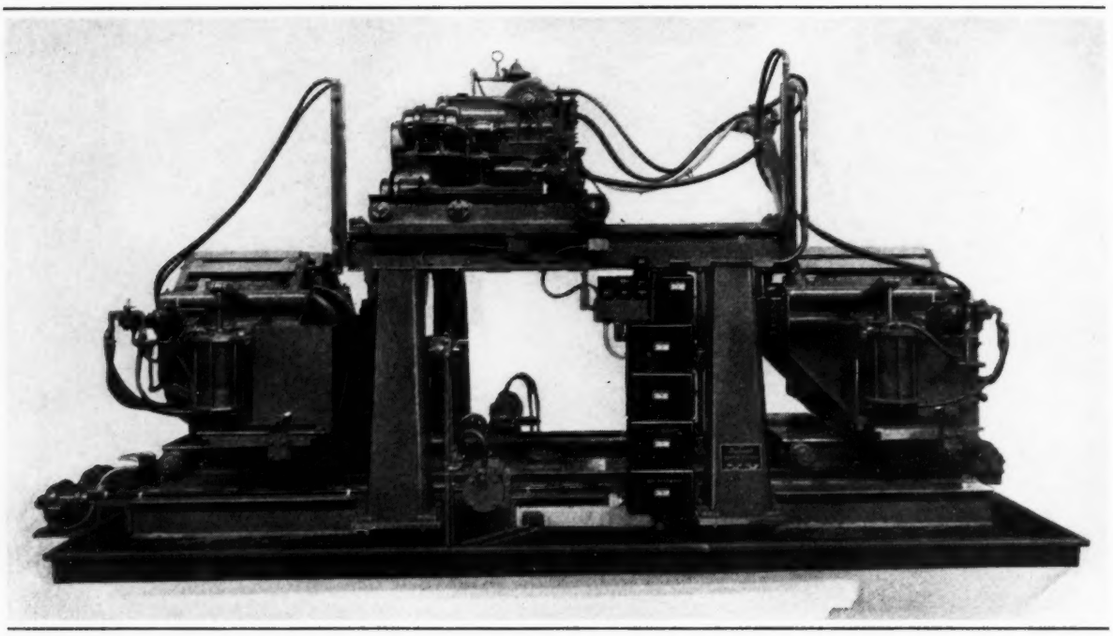


Fig. 7. A Duplex Type Machine Making Use of Two Welding Fixtures, One of which is Loaded while the Other is Passing through the Welding Cycle

A machine designed for performing this work is shown in Fig. 1. There are several modifications of this machine. It may be built with or without the motor shown in the foreground for moving the welding fixture into and out of the welding position.

Briefly, the machine consists of a welded base carrying a track for the movable clamping fixture which accurately holds the cabinet and its top in the proper position for welding. There are four upright columns attached to the base, which carry the welding carriage on an overhead track. On the welding carriage are mounted the required transformers, welding wheel electrodes, air-pressure tanks and cylinders, motors, and variable-speed drives.

The machine operates as follows: The square top is placed in the fixture against stops or blocks. Then the box-shaped stamping is placed in the fixture. The operator next manipulates an air valve, which, through a toggle action, places the fixture supports in the proper position, as indicated in Fig. 4. Another air valve operates the clamping dies from the outside of the case, thereby holding the parts rigidly in relation to each other.

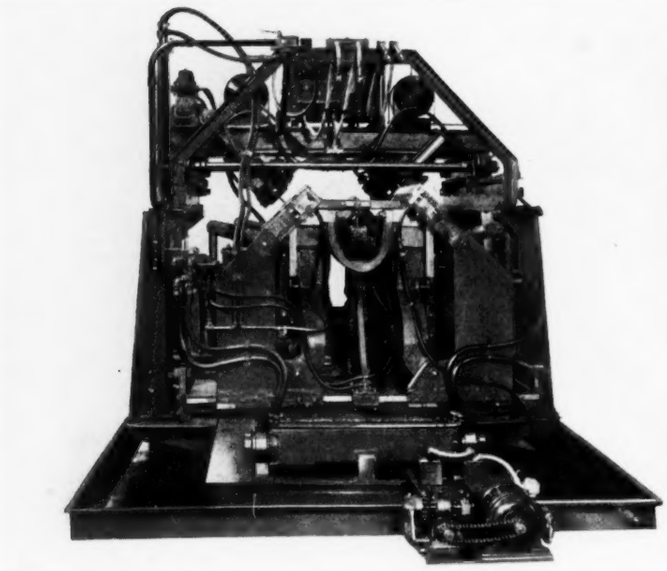


Fig. 8. End View of Duplex Type Machine Shown in Fig. 7

The welding wheels mounted on the top moving carriage are now brought down against the work; when a predetermined pressure has been applied, the current is automatically turned on and the machine started, the carriage traveling across the work to the end of the weld, where the current is cut off and the wheel automatically lifted. The machine then returns to its starting position. Reversing the air valves unclamps the work, after which the machine is ready for the next cycle.

Sometimes the seam must start or stop against a flange, in which case a notch is provided in the welding wheel, as indicated in Fig. 5. This, in combination with the positive means of locating the work with relation to the wheel, makes it possible to weld work of this character. Fig. 6 shows diagrammatically how welds are made when it is desirable to

have the seam on the curved corner of the cabinet instead of on a flat surface.

With machines of this type, experienced operators are able to weld at a speed of 30 linear feet per minute. Adjustable limit and safety switches are provided at all important points of the equipment to prevent over-travel or damage due to carelessness. Two welds are made with the same current and multiple-electrode wheels. This is known as series welding, because the current flows from one transformer through the welding electrode and the work, then by way of the lower die and a conductor to the opposite die, and finally through the opposite seam and welding electrode back to the transformer, making two welds in passing. The fixtures are adjustable for different sizes of cabinets by simply changing the dies. The welding wheel electrodes are adjustable for width to suit varying requirements.

A modification of the machine shown in Fig. 1 is of the duplex type, as shown in Figs. 7 and 8. This machine has two welding fixtures, one of which is unloaded and loaded while the work in the opposite fixture is being welded. These fixtures are interlocked and moved into and out of the welding position by mechanical or hydraulic power. It will be noted that this machine is arranged for performing welding operations on rounded corners, as illustrated in Fig. 6.

The welding of refrigerators constitutes one of the important applications of resistance welding. The results obtained by this method have warranted the building of machines especially developed for this purpose. Here is an interesting example of a case where a new industry—automatic refrigeration—has provided an opportunity for the application of a new method of construction—that of resistance welding.

Exports of Industrial Machinery Show Marked Increase

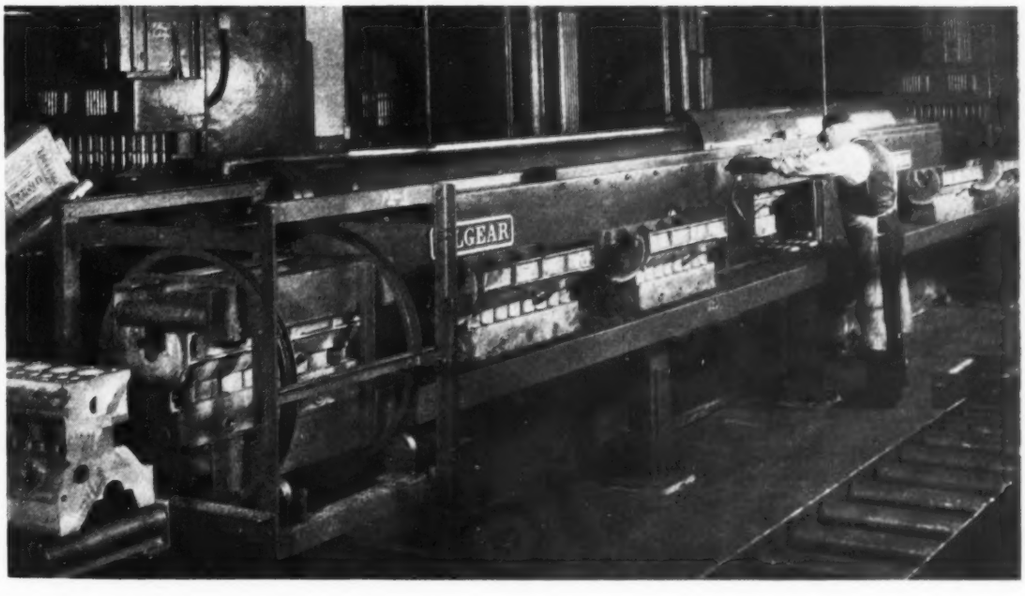
Exports of industrial machinery from the United States during January, this year, were valued at over $14,000,000, compared with $8,350,000 during January, 1935, an increase of 68 per cent, according to the Machinery Division of the Bureau of Foreign and Domestic Commerce. Of the exports in January this year, nearly $4,000,000 were accounted for by power-driven metal-working machinery, compared with $1,430,000 last year. Marked increases were also noted in the textile, sewing, and shoe machinery groups.

* * *

Broaching Crankcases at the Packard Plant

The accompanying illustration shows a large Oilgear broaching machine which is used in the plant of the Packard Motor Car Co., Detroit, Mich., for broaching the sides and bottoms of the main bearing-cap surfaces that mate with the webs of the crankcase.

The cylinder block is located in the machine by the manual operation of a lever. It is then hydraulically clamped, after which it is broached and the broach returned automatically. If the cylinder block is not located properly, a safety device prevents the machine from pulling the broach. Note the conveyors carrying the cylinder block to and from the point where it slides into the working position in the machine, and the means at the left-hand end for turning the cylinder block over to its working position—devices that are truly labor-saving in that they avoid heavy lifting.



Oilgear Broaching Machine in the Packard Plant for Broaching the Sides and Bottoms of Main Bearing-cap Surfaces on Cylinder Blocks

Liability for Noise and Vibration Produced in Manufacturing

By W. F. SCHAPHORST

The court decision quoted on page 457 of March MACHINERY may cause some readers to believe that in all instances noise and vibration are legally permissible. That, however, is not the case. There are cases where noise and vibration caused by machinery have been declared by the higher courts to be a "nuisance" and, therefore, unlawful.

A concern in New Jersey manufacturing chemical devices and conducting an experimental laboratory in which delicately adjusted instruments were used brought action against a neighboring plant in which a high-speed engine was operated. The vibrations of the engine caused trouble in the plaintiff's plant. The defendant maintained that the plaintiff should not attempt to carry on his business in that location if he did not like the vibrations. He stated that it was a "factory district" in which vibrations and noise were permissible. Yet, the plaintiff won the decision. The defendant appealed to a higher court, but that court also decided in favor of the plaintiff. The following, in part, is what the higher court said:

"The law guards jealously, for all alike, the enjoyment of all private property. The right of enjoyment is surrendered in a factory district only to the extent of the inconvenience incident to the character of the business carried on there.

"The ceaseless pounding of the vibrations from the defendant's engine against the walls of the plaintiff's mill is not incident to the neighborhood. The same annoyance would happen, under the same conditions, if both factories were on a farm. It was not a neighborhood hazard to be anticipated, and is not one to be suffered. Community vibrations must be endured, but vibrating a community is a nuisance."

Many manufacturers do not seriously concern themselves about noise and quietness. They seem to think that noise is a necessary evil or not worth eliminating. Some of them play safe and locate in rural communities or small towns where there are no ordinances against noise; but the modern tendency in the better factories, regardless of size, location, and laws, is to reduce noise as much as practicable.

One can easily prove that some noisy machines are uneconomical, as well as offensive to the sense of hearing. The writer has frequently seen foremen of noisy shops beckon a man into a private room or other quiet place where they could converse more readily. During the conversation, the workman's machine is idle. Definite, distinct instruction is essential to efficient management. It is not bad practice to call a man away from his work for a few moments where noise is unavoidable; but where the noise is preventable, steps should be taken to prevent it. The workman can then continue his work while conversing with the foreman, and time will not be lost running about.

Not only are employe relations improved, production increased, and quality bettered in this manner, but the efficiency of the machine that has been made more quiet is generally enhanced. History tells us that the first steam engine was the embodiment of noise, the first gas engine was even worse, the first locomotive was by no means quiet, nor was Fulton's steamboat. In every instance, increase in efficiency has been accompanied by reduction of noise. Simply because noise has been associated with work in years past is no reason why we should allow it to continue. There are few noisy machines that cannot be made quieter and consequently more efficient.

* * *

Decimal Dimensions Have Simplified Ford Manufacture

Several years ago the Ford Motor Co. adopted the decimal system of dimensioning drawings for automobile and truck parts. This has considerably simplified the designing and making of tools, jigs, gages, etc., and has also facilitated manufacturing and inspection operations.

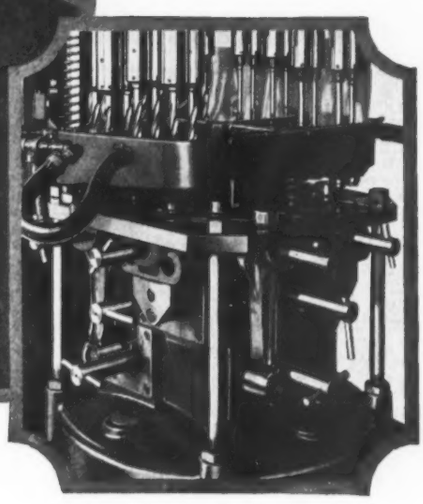
The first step in instituting this system of measurement was to replace all common fraction measuring scales with scales graduated basically in tenths of an inch. These scales are subdivided into fiftieths (0.02) of an inch. Dimensions less than one inch are now given on drawings in tenths and hundredths of an inch in the form of decimals, and always in multiples of 0.02 inch. Thus, all dimensions are conveniently divisible by 2—a fact that is of great help to draftsmen in spacing lines equidistantly on both sides of center lines. This eliminates the annoyance of splitting cumbersome mixed numbers in drafting. Close dimensions are, of course, given in thousandths and ten-thousandths of an inch.

Adding a number of mixed numbers, which is constantly being done by draftsmen, can be done with ease when all the dimensions are given in decimal form. No mental effort is required, in comparison with that necessary when dimensions are given in sixteenths, thirty-seconds, and sixty-fourths of an inch. Subtracting, multiplying, and dividing are also simplified.

When dimensions must be determined through the use of trigonometric functions, only one or two numbers need ordinarily be multiplied with the Ford system, whereas in the case of ordinary common fractions changed to decimal equivalents, from three- to six-place decimals are often required for accurate results.

The decimal system of dimensioning was adopted in all Ford plants and service stations with little confusion. The company claims, after several years' use, that this system of measurement is ideally suited to precision manufacture.

Design of Tools and Fixtures



Boring Tool with Micrometer Adjustment

By PHIL. E. VERAA, Richmond Hill, N. Y.

A boring tool designed by the writer, which can be screwed directly on the lathe spindle, is shown in the accompanying illustration. This tool is provided with micrometer adjustment. By using a straight adapter having a taper hole for the drill, the hole to be bored can be drilled in the same setting.

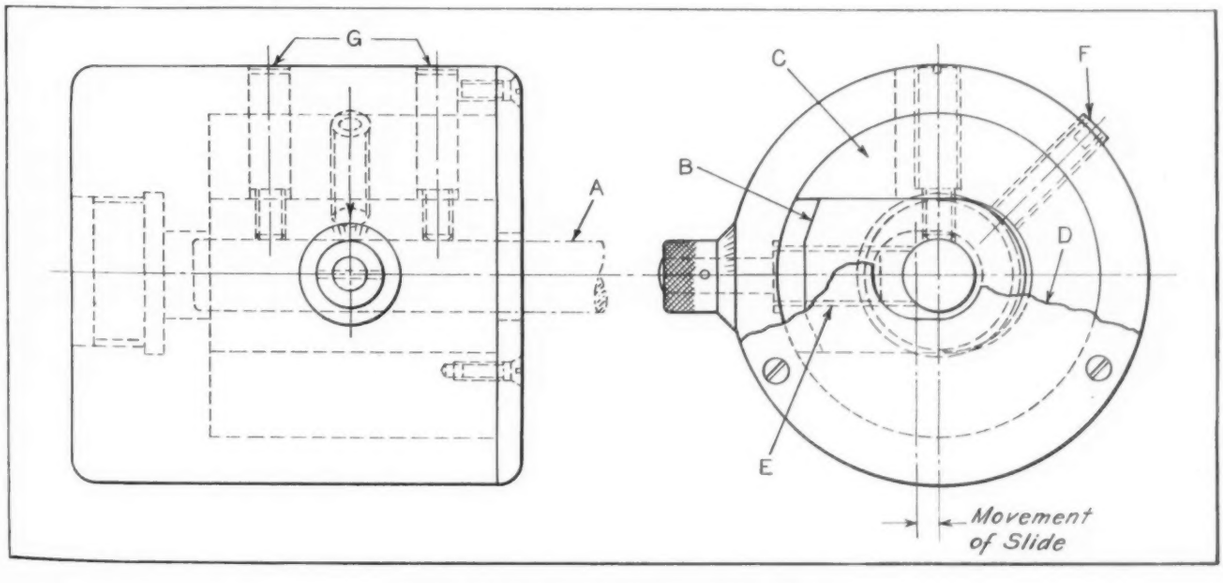
The boring-bar *A* is clamped in the slide *B* by means of the set-screws *G*. Slide *B* is a slip fit in the U-shaped guide block *C*. The cover plate *D* closes the unit entirely, preventing chips from entering.

The indexing screw *E* has twenty threads per inch, and the dial has fifty graduations. Each graduation represents a movement of the slide equivalent to 0.001 inch. After each setting of the index screw, the slide is locked by tightening screw *F*. This screw passes through both the tool body and the guide block, which are drilled and tapped when assembling.

Fixture with Interchangeable Indexing Bars for Spacing Rivet Holes

By JOSEPH WAITKUS, Wellsville, N. Y.

The production of the sheet-metal part shown at *W* in the illustration (see next page) presented an interesting problem in fixture design. Sheet-metal parts of this kind are first formed to the shape shown, after which a series of rivet holes are punched along one edge. The spacing of the



Boring Tool with Micrometer Adjustment

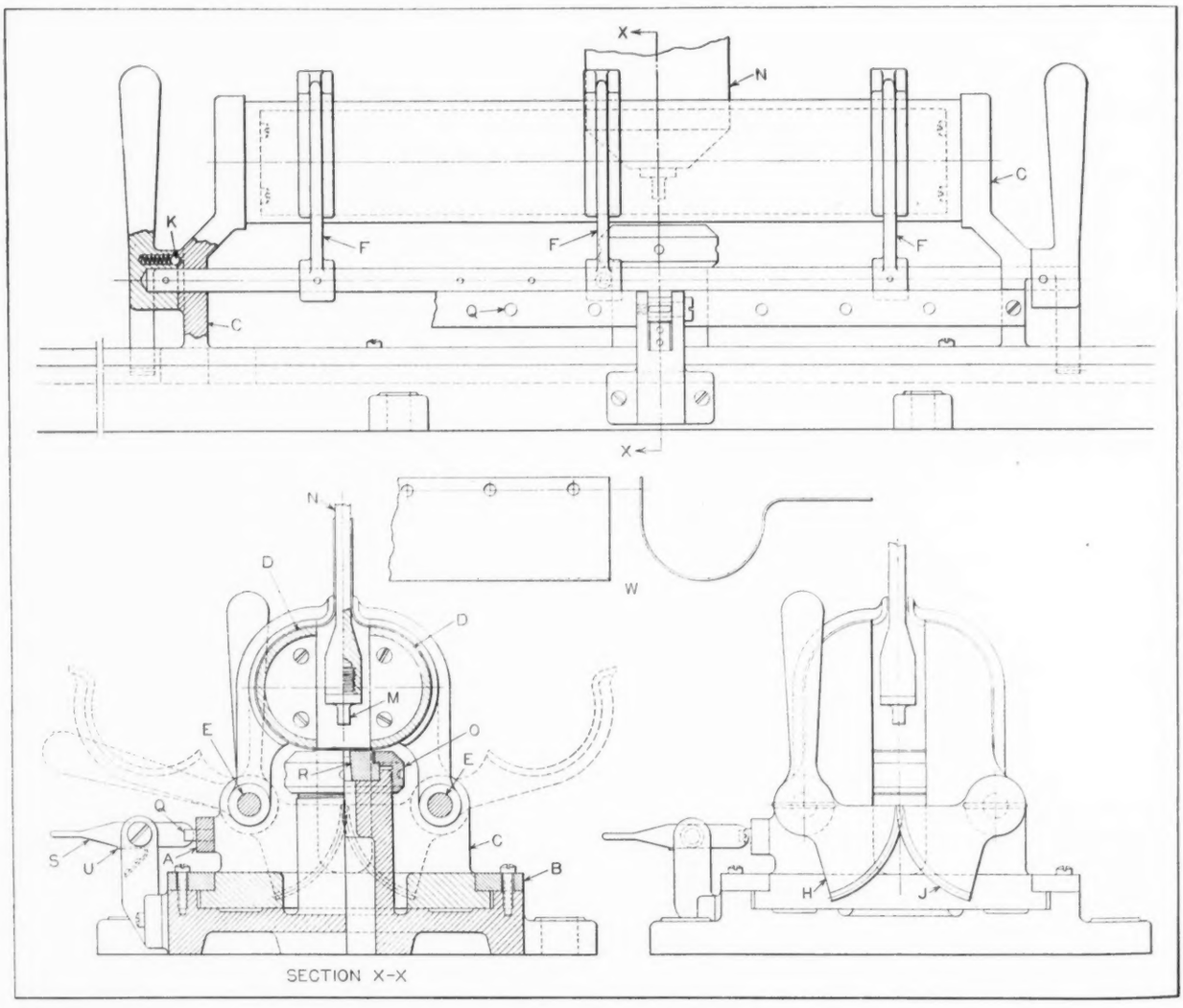
rivet holes is not uniform, but varies according to the length of the part, which ranges from 6 to 15 inches.

To avoid having a fixture for each length, the special fixture shown in the illustration was developed to accommodate all sizes and permit unlimited variation in the spacing of the rivet holes. This fixture enables two parts to be punched simultaneously. The templet or indexing bar *A* provides for very accurate spacing of the holes. This insures interchangeability and rapid production.

As the largest part handled is about 15 inches long, it is necessary to have a relatively long base for the fixture. This base is fastened to the table of the ordinary punch press, making provision for supporting the entire length of the base. Bars *B*, fastened to the base, serve to guide the end plates *C*. The design of the guiding arrangement permits lateral adjustment, which is essential for proper alignment of the work with relation to the punch and die, in setting up the fixture.

The end plates are held together by two forms *D*. These forms have the same shape as the pieces to be punched. Two shafts *E*, provided with three sets of fingers *F* which conform to the outside shape of the work, serve to press the work against the forms *D*. The end fingers are fastened permanently to the shafts, whereas the middle fingers are adjustable and can be moved to any position desired, holes being provided in the shafts for small removable taper pins. This arrangement permits at least two sets of fingers to be applied to each part, regardless of its length.

The operating mechanism for the fingers consists of a set of gear segments *H* and *J*, fastened at the ends of shafts *E*. A handle is provided on gear segment *H*, which permits rotating the shafts and removing the fingers *F* from the work, so that it can be replaced. In order to retain the fingers in the open position while the work is being replaced, and also to hold them in the closed position when the parts are being pressed against the forms *D*, a latch is provided in the gear segment *H* which consists of a ball *K* backed up by a coil spring. There are two depressions in the end plates *C* for receiving the ball *K*, one being for the open posi-



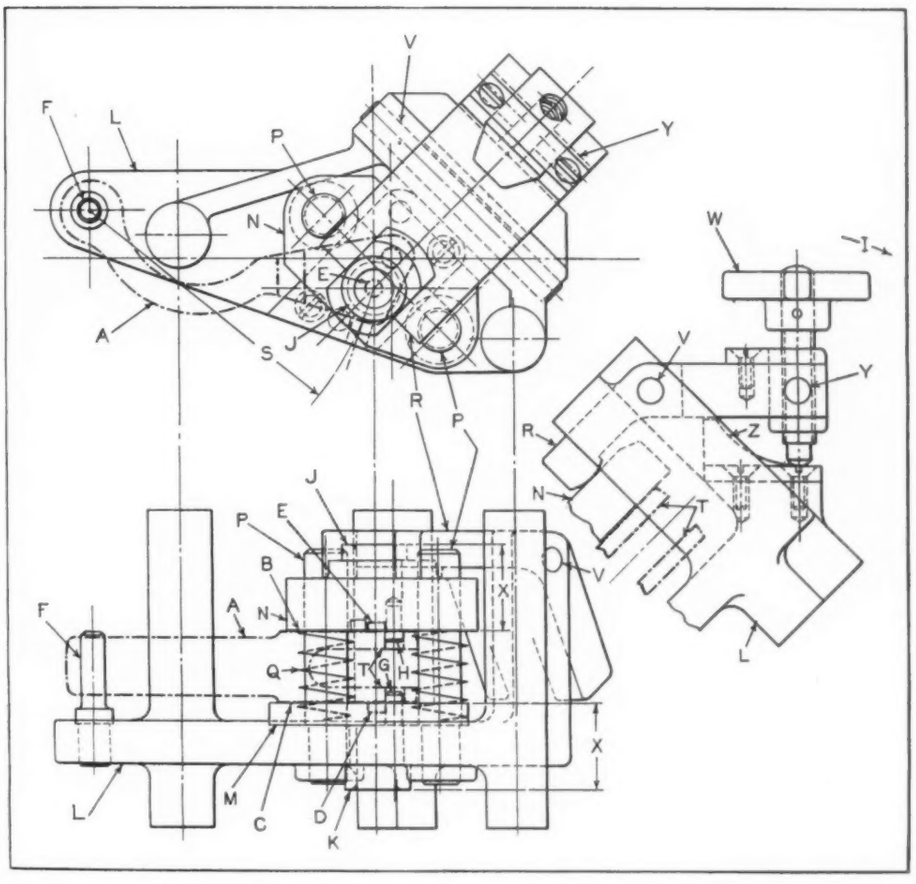
Fixture with Interchangeable Indexing Bar A for Obtaining Any Desired Spacing of the Holes Pierced by Punch M in Two Parts W, which are Held in their Assembled Positions by the Clamping Fingers F

tion and the other for the closed position of the clamps.

The punch and die arrangement is somewhat different from that ordinarily employed. The punch *M* is screwed into a special holder *N* which is fastened to the reciprocating head of the punch press. The holder *N* is so constructed that it can pass between the two pieces to be punched and serve as a spacer for holding them in their proper positions when the fingers *F* are closed. The punch can be easily sharpened or renewed. The die-holder is a part of the base and is provided with a threaded ring *O* which holds the die *R* in place.

The most important part of the fixture is the templet *A*, fastened to the end plates *C*. This templet is relatively easy to construct. It can be made in various sizes, which can be quickly interchanged to suit requirements. The templet is provided with the pins *Q*, fastened in place permanently. These pins are spaced to suit the spacing of the holes in the work. The stop arranged for locating the work by means of the pins in the indexing bar consists of a bracket, fastened to the base and provided with the pivoted stop-bar *S*. A spring *U*, fastened to the bracket serves to keep the stop-bar in the horizontal position.

The pieces to be punched are first pressed on the forms *D* so that their edges rest against the end plates *C*. The fingers *F* are then clamped over the work. By holding both handles on the segments *H*, the operator can easily move the work under the punch, pausing just long enough to trip the stop-bar *S* after each hole is punched.



Trunnion Milling Fixture Equipped with Wide-opening Clamp

Fixture for Milling Trunnions in Accurate Alignment

The problem of hollow-milling two small bosses or trunnions in exact alignment was solved by using the fixture shown in the accompanying illustration. Trunnions *D* and *E*, on opposite sides of the work, which is indicated by heavy dot-and-dash lines at *A*, were first machined by finishing surfaces *B* and *C* by rotary milling with an end-mill in a vertical-spindle machine. The rotary motion left the two trunnions in the rough-milled state. The next problem was to finish the two trunnions so that they would be in accurate alignment. The work had previously been drilled and reamed, so that it could be located over the long pin *F* and the two short pins *G* and *H*.

The operation of hollow-milling was performed through the bushings *J* and *K*, working from opposite sides of the fixture. A stop-collar on the shank of the hollow-mill, which makes contact with the end of the bushings, gives the correct length for the trunnions. The base of the fixture *L* is of welded-steel construction, with three legs on each side. The work rests on a hardened plate *M*. A plate *N* acts as a clamp on the opposite side of the work. Plate *N* has a vertical movement over two guide pins *P*. Springs *Q* cause this plate to rise so that it clears the work when the hinged clamping member *R* is swung upward on pin *V*.

This allows the pin *H* to clear the upper hole in the work, and as plate *N* continues to rise, the amount of clearance is increased to permit the work to be lifted off the lower pin *G* and swung toward the front of the fixture. The work can then be lifted off pin *F* and a new piece put in its place.

In releasing plate *N* from its clamping position, the operator swings the knob *W* in the direction of

the arrow *I*, so that the end of the screw clears the cam surface *Z* while pivoting about pin *Y* as a center. This allows the opposite end of the clamp to clear the plate *N*. In clamping another part, the knob *W* is swung to the left, causing the end of the screw to ride along the surface *Z*. When the screw has reached the position shown in the view to the right, the knob *W* is turned, clamping the work securely in place. This method of clamping permits the jig to be turned over for drilling against the clamp without danger of loosening. H. M.

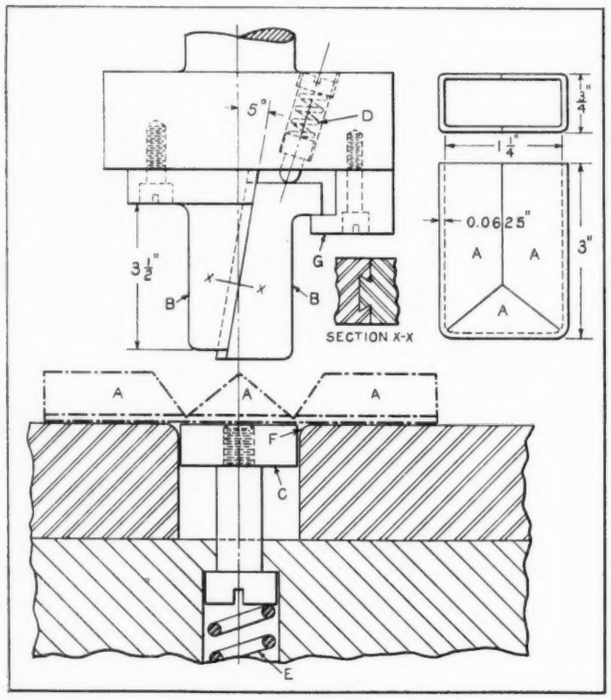
Forming Die with Collapsible Punch

By C. W. HINMAN

In forming the deep rectangular receptacle shown in the upper right-hand corner of the illustration, it was found that the longest press stroke available was not sufficient to permit using the punch stripping devices ordinarily employed. The collapsible punch type of die illustrated was designed to overcome this difficulty. The six side wings *A* of the work are bent up, as shown by the heavy dot-and-dash lines, previous to the forming operation on the die illustrated.

The thickness of the collapsible forming punch *B* is 0.005 inch less than the inside width of the receptacle opening, so that there is no difficulty in stripping the work from the punch, as far as the width dimension is concerned. When the press ram descends, the right-hand part of punch *B* comes in contact with the work, shown by the heavy dot-and-dash lines. As the resistance offered by the work and the spring *E* is greater than the pressure exerted by spring *D*, the right-hand half of punch *B* is forced upward until it is seated on the punch-holder. The right-hand half of the punch, in traveling upward, moves on the dovetail slide, set at an angle of 5 degrees with the center line of the punch. This causes the effective width of the punch to be increased to the proper dimension for forming the receptacle. As the punch continues its downward stroke, it closes the wings *A* together against the forming blocks *F*, finally bringing the pad *C* to rest on the die-shoe at the end of the downward stroke.

When the punch ascends, the pressure of the spring-actuated pad *C* forces the work out of the forming die, so that it rests on the pad flush with the surface of the die. The continuous upward movement of the punch causes the solid or left-hand portion of the punch to draw away from the bottom of the work first, owing to the pressure exerted on the right-hand section by spring *D*. This movement allows the punch to collapse, or assume the position shown in the illustration, where the downward movement of the right-hand section of punch *B* is stopped by piece *G*. The collapsed punch then leaves the work free when the top of the press stroke is reached. The finished piece, which is left standing on pad *C*, is removed when the next piece is placed in position for forming.



Forming Die with Punch Designed to Facilitate Removal of Work

* * *

Employment in Automobile Industry Now Well Stabilized

The Automobile Manufacturers' Association has announced that the production of automobiles gave work, in 1935, to a higher average number of people than in any preceding year except 1929. It reached a figure of 438,000 workers, which was but 10,000 less than in 1929. Employment was also much more evenly distributed throughout the year. During only two months in 1935 were there less than 400,000 employes, and in only four months was the figure as low as 430,000. The industry has thus achieved one of its main objectives in stabilizing production and employment.

* * *

General Electric Pension System Real Social Service

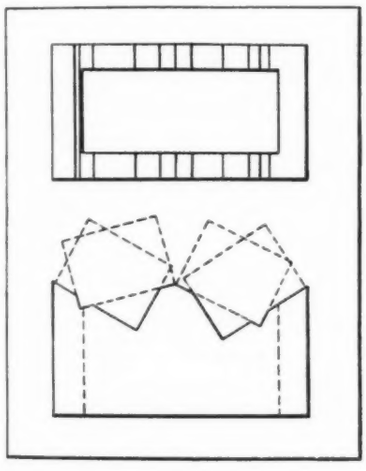
The pension payments to retired employes of the General Electric Co. for 1935 totaled $2,589,053. The number of people receiving pensions was 3290; their average age, 67 1/2 years; the average length of continued service, 29 1/2 years; and the average amount of the annual pension, $771. Since the establishment of the pension plan in 1912, over $15,630,000 has been distributed.

Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

Simple Cradle for Holding Drill Jig at Different Angles

A jig for drilling several straight holes and four holes located at different angles had to be held in four different positions for drilling the angular holes. Four cradles could, of course, be used, but they would be awkward and heavy to move. An adjustable angle-plate could also be employed, but this would slow up the operation because the angular adjustment would have to be changed four times for each piece.



Cradle for Holding Jig at Different Angles

A single cradle was finally adopted in which provisions were made for locating the jig in all four angular positions, as indicated by the dotted lines in the accompanying illustration. Each angular locating surface on the cradle has a number stamped on it that corresponds with the number stamped on the bushing in the jig for that particular angle.

Hamilton, Ont., Canada — F. MUIR

Lengthening the Life of Drill Bushings

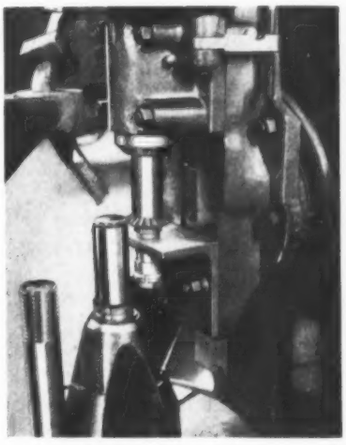
Referring to an article on page 328 of January MACHINERY, it has been the writer's experience that, when a bushing hole is larger than the drill, the location of the hole produced will vary, depending on the kind of obstructions and resistance the drill point meets in starting the hole. This variation will take place, regardless of which way the bushing is turned or what part of it is out of round.

It would seem that it is hardly worth the trouble of turning the bushing around 90 degrees when we consider the low cost of commercial bushings. Bushings up to 1/4 inch can be bought for as little as sixty cents. It is hardly possible to remove a bushing, grind a flat on it and put it back in place for such a small amount. Then, when this has been done, we still have an over-size or out-of-round bushing.

Cleveland, Ohio — EDWARD HELLER

Milling Threads on a Gear-Hobbing Machine

The standard Gould & Eberhardt gear-hobber can be used advantageously in some cases for milling threads of ordinary leads. The vertical feed, when equipped with gears having the same number of teeth, gives a lead of 8, which is equivalent to a lead-screw having eight threads to the inch. It is necessary to provide a simple end-support for the cutter-spindle, as shown in the illustration, because the regular end-support occupies too much space.



Gear-hobbing Machine Set-up for Milling Threads on Tough Steel Shaft

The illustration shows the set-up used in milling a 1 3/4-inch, 5-pitch, U. S. standard thread. The thread is milled for a length of 2 1/2 inches at each end of the piece. As the threaded work in this case was 3140 steel, it was not well suited for threading in the lathe. However, when milled as illustrated, the thread had a fine finish and accurate form. A finished piece is shown to the left of the work-spindle.

When threads are to be milled on slender work, a special center support may be required. This was not necessary, however, in the case of the piece shown. The end-support for the cutter-spindle has a taper bronze bushing, held in a steel sleeve supported in the angle-plate which is attached in place of the usual arbor support.

Pasadena, Calif. — O. S. MARSHALL

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Eliminating Soft Spots from Hardened Tools

C. H. B.—A large tool having a cross-section about 5 inches in diameter appears to develop soft spots after a short period of use, resulting in uneven wear. The hot-rolled tool steel employed is carefully selected and hardened by methods that have given excellent results in the case of smaller tools of a similar design. Can anyone explain the reason why we experience this difficulty with the larger tools and suggest some method by means of which this trouble can be eliminated?

A.—The trouble is probably due to decarburization of the surface of the hot-rolled material. To eliminate soft spots in a tool of this size, an allowance of about 3/8 inch on the diameter between the forged or rolled size and the finished size of the tool should be made. This means that the surface of the forged or rolled tool should be removed for a depth of about 3/16 inch to insure freedom from soft spots.

Failure to Fulfill Contracts Because of Strikes

L. P. B.—Suppose a manufacturer contracts to deliver machinery within a specified time and fails to make delivery on account of a strike. Is he liable? What recourse has the purchaser? Will a printed notification on the contract to the effect "Not responsible for delays caused by strikes, etc." relieve him? What is the best plan and method to avoid liability from this source?

Answered by Leo T. Parker, Attorney-at-Law
Cincinnati, Ohio

In general, the fact that the seller is prevented from making delivery on account of a strike does not relieve him from liability. The law is that the purchaser is not at fault, but stands ready to fulfill his part of the contract; hence the contract is valid.

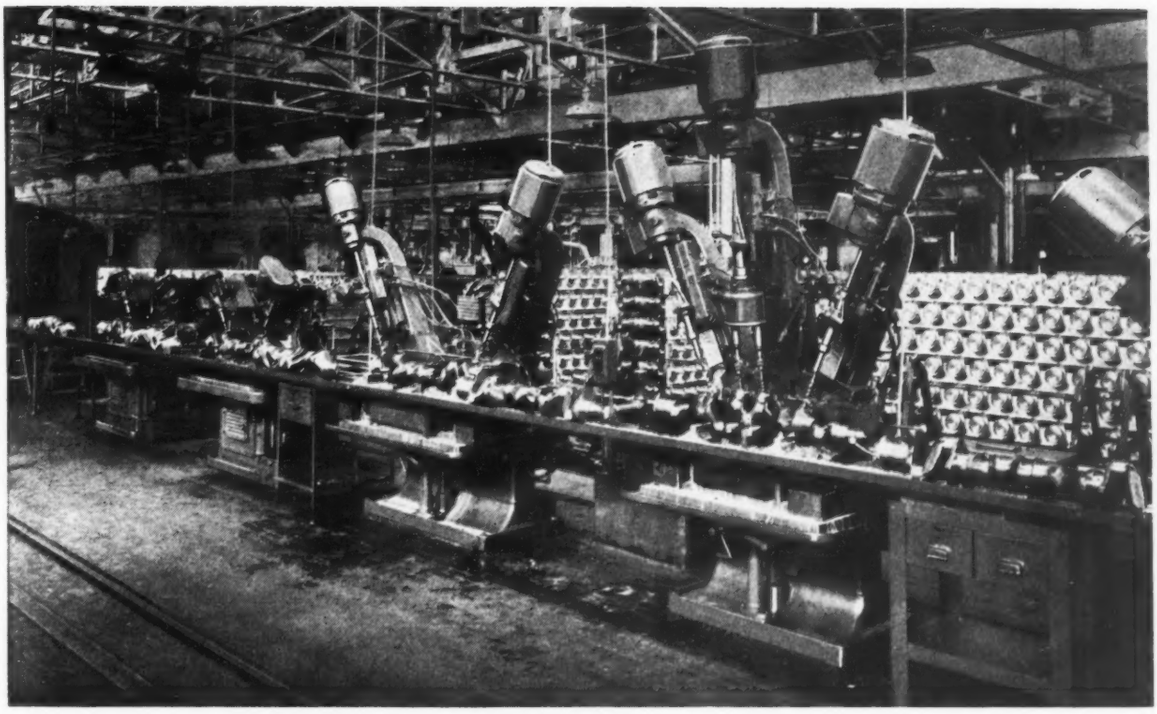
With respect to a printed notification on the contract, various courts have held that the printed notice on a contract, receipt, billhead, bill of lading, order form, or letterhead is not binding if the printed statement is contradictory or opposite to another portion of the contract. Moreover, it has been held that a notification printed in small type is not binding, unless it is referred to in the body of the contract or the other party's attention is clearly directed to it in some other manner. This law applies alike to contracts contained in ordinary correspondence and to various other kinds of written agreements.

On the other hand, a printed statement on a letterhead or in a contract which is clear and conspicuous and which is not contradicted by any other portion of the contract is valid and enforceable. For example, in Charles v. McAdams [155 N. E. 526], the contract contained a clause as follows: "The seller shall not be responsible for failure to ship according to the terms and conditions of this contract, where such failure is caused by any fires, strikes, labor difficulties, failure of carriers to furnish facilities or acts of carriers. . . ."

This clause was printed in such a location that the buyer must have observed it if he read the contract at all. Therefore, the Court held the seller not liable for failure to make delivery.

Now with regard to the general procedure in cases where a seller fails to make prompt delivery or fails to deliver the quality of goods specified: It is important to know that the law provides three remedies when the seller repudiates a valid contract of sale: (1) The purchaser may treat the contract as having been broken and may notify the seller to pay damages; (2) the purchaser may endeavor to continue to fulfill the contract, being at all times himself ready and able to perform his obligations, and at the expiration of the contract he may sue and recover the damages and anticipated profits; or (3) he may treat the seller's breach as an end to the contract and file suit immediately, without sending notification to the seller of the intended legal action, and may recover the damages sustained and the profits he would have made on the machinery if the seller had fulfilled the agreement.

In accordance with this settled law, the seller may be sued by the purchaser for the amount of damages and loss of profits sustained by the buyer through the failure to fulfill the contract; or the buyer may purchase the equipment that he requires in the open market and recover from the seller the difference between the price he paid and the price for which he contracted.



Hydraulic Step-by-Step Drilling of Deep Holes

This Method Has Become Standard Practice throughout the Automotive Industry. It Can Also be Applied Advantageously in Other Plants Engaged in the Manufacture of Metal Products or Machinery

WHEN deep holes are drilled by the use of a continuous feed, a number of factors slow up production, shorten drill life, and make accuracy difficult to attain. These handicaps to efficient deep-hole drilling have been eliminated in a method made possible with equipment developed by the Leland-Gifford Co., Worcester, Mass. This method involves the use of a hydraulically operated head which automatically feeds the drill to a predetermined depth, withdraws it completely from the hole, and again advances it to a predetermined depth. This cycle is repeated until the hole has been drilled entirely through, or, in the case of a blind hole, to the required depth.

With each withdrawal of the drill, the hole is completely cleared of chips and a copious stream of coolant fills the hole, cooling both tool and work. With this method, drills may be used that have flutes extending only a small fraction of their length and that have thicker web sections than standard drills, therefore possessing greater strength.

In order to analyze what occurs in drilling a deep hole with a continuous feed, let it be assumed that a 3/16-inch hole is to be drilled to a depth of 12 inches in S A E 1045 steel, using a two-fluted twist drill. Obviously, with the long slender drill necessary for this operation, which can be supported at one end only, the cutting end is likely to become deflected if excessive end thrust or torsional strain is imposed on it. The drill will then deviate from its true path through the metal or break under the load.

In this method of deep-hole drilling, end thrusts or torsional strains are likely to be excessive, because two-fluted drills must be made with a com-

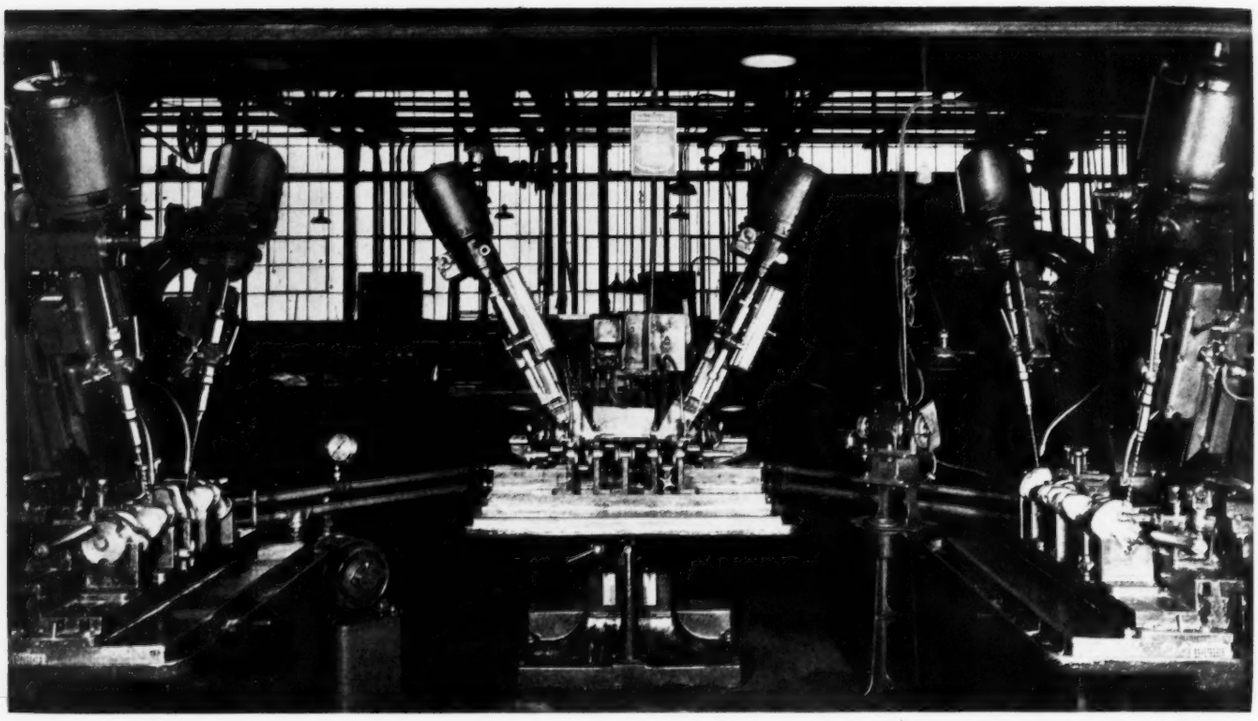


Fig. 1. A Battery of Hydraulically Operated Deep-hole Drilling Machines which Employ the Step-by-step Method for Producing the Oil-holes in the Crankpins of Nash Crankshafts

paratively thin web, so that lubricant or coolant can be delivered to the drill point and so that the chips can escape from the hole. To meet these requirements, the cross-sectional area of the drill must be considerably less than the area of the hole itself. It thus becomes difficult for small-diameter drills to remain rigid under abnormal loads.

The energy applied to the point of the drill in an operation is transformed into heat that must be absorbed by the metal being drilled, the drill itself, and the coolant. The maximum heat is produced on the cutting edges of the tool. If sufficient coolant does not reach the drill point, as when a hole becomes clogged with chips, the cutting edges will dull readily and perhaps become burned. If one cutting edge dulls before the other, forces will be introduced that will deflect the drill from its true path.

In the hydraulic step-by-step method of drilling deep holes, the depth to which the drill is fed into the work with each forward stroke of the hydraulic head is so controlled that the forward movement is completed before excessive thrusts occur and before the hole becomes clogged with chips. Only a small quantity of chips is produced at each forward drill movement, and it is for this reason, that drills can be used having flutes extending only a fraction of their total length and with a thicker web than standard drills. The greater drill rigidity and strength provided by the larger cross-sectional area of the fluted end enables the drills to resist heavy thrusts in any direction.

Generally speaking, the practice is to drill to a depth equal to the drill diameter at each step. Thus, for example, in using a 1/4-inch drill, stock to a depth of

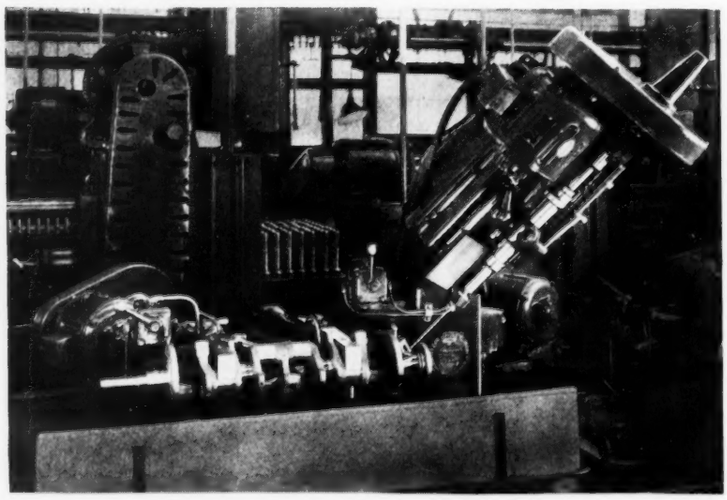


Fig. 2. Another Deep-hole Drilling Machine which Produces Two Long Holes at Angles in the Cast-alloy Lincoln-Zephyr Crankshafts

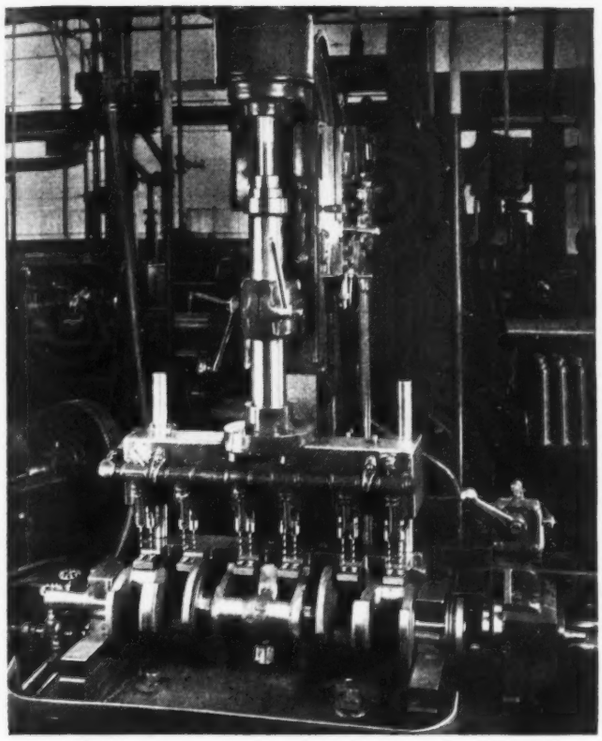


Fig. 3. Machine Arranged for Hydraulic Step-by-step Drilling of Twelve Oil-holes in Lincoln-Zephyr Crankshafts

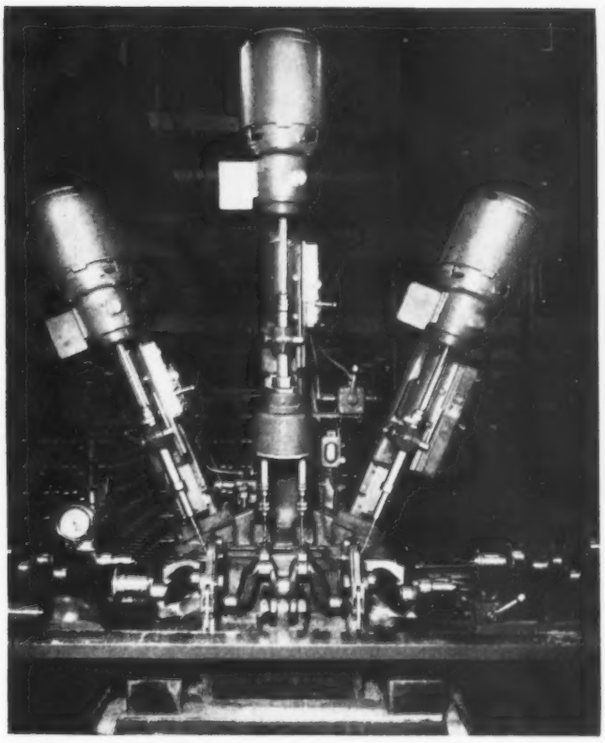


Fig. 4. One of a Battery of Six Machines which Drill a Total of Seventeen Oil-holes in Buick Crankshafts

approximately 1/4 inch would be removed with each forward stroke of the drill head. However, with certain materials, such as cast iron, a drill of, say, 1/2 inch diameter could be fed to a depth somewhat greater than 1/2 inch with each stroke. Since the hole is completely flooded with coolant each time the drill is withdrawn, the temperature of the work and drill point does not become excessive.

Accurate holes and long-life drill points are two important advantages of this controlled method of step-by-step drilling. For example, a 3/16-inch hole can be drilled 7 inches deep through alloy steel, straight within 0.010 inch. The time consumed in advancing and withdrawing the drills is negligible, because, with the hydraulic head used, these movements are speeded up much faster than the feed employed in the actual drilling.

The Leland-Gifford hydraulic heads used in step-by-step drilling are of unusually simple design. They are mounted on slides and connected to sleeves in which the drill spindles revolve. A patented control system imparts a forward movement to the drill head at a fast rate to bring the drill point to the work, then advances the drill at a feed rate to the predetermined depth, and finally withdraws the spindle at a fast rate. If the operation consists of drilling two holes in line, the feed can be separated with a fast traverse for bringing the drill point to the second hole. The length of the forward and return movements of the hydraulic feed is increased with each step in an operation until the hole has been drilled to the required depth; then the hydraulic head is returned to its

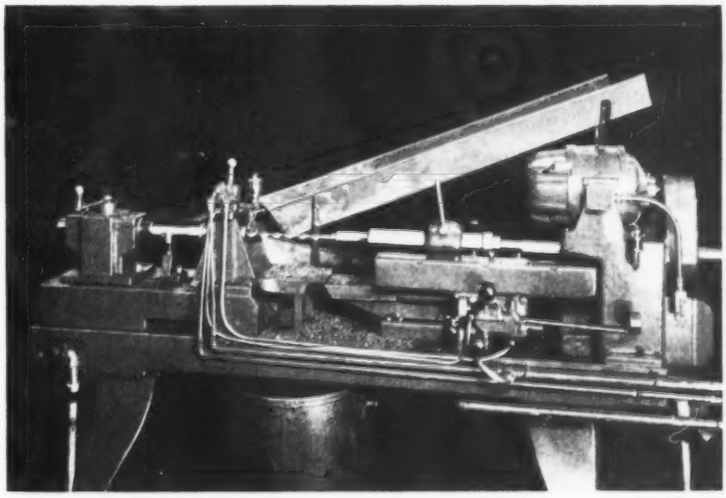


Fig. 5. Drilling a Blind Hole 51/64 Inch in Diameter and Almost 9 Inches Deep in an Iron Casting for Textile Machinery

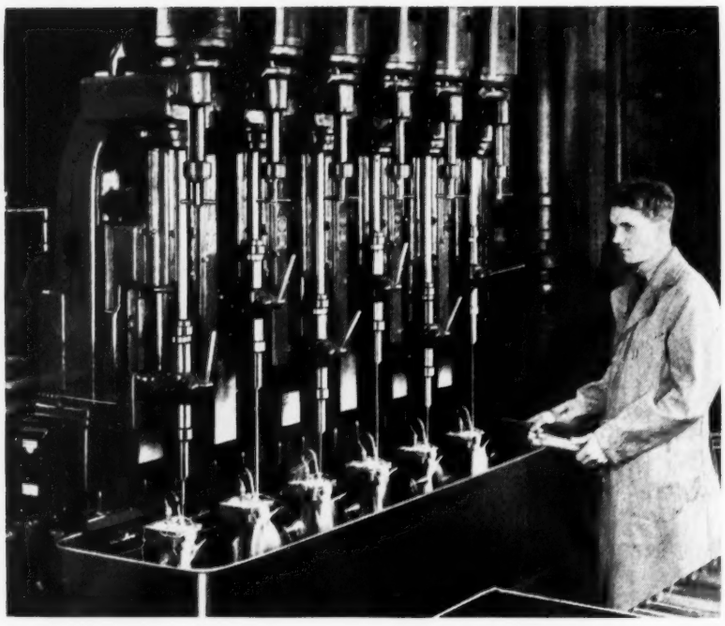


Fig. 6. Six-spindle Machine Employing the Step-by-step Method of Drilling Holes More than 6 Inches Long through Packard Connecting-rod Forgings

completely withdrawn position and stopped. The hydraulic heads are equipped with an overload release, which automatically withdraws the drill from the work when the drill point becomes too dull or when a hard spot is encountered that would result in drill breakage. A gage shows the pressure at all times, thus enabling the operator to observe any indication of improper drilling conditions.

Only one source of hydraulic power is required for a whole battery of machines, and the machines may be of single- or multiple-spindle types. The heading illustration shows a battery of six deep-hole drilling machines installed at the plant of the Buick Motor Co. in Flint, Mich. Regardless of the number of machines in an installation, the hydraulic power is provided by a compact self-contained unit, which has a spring-loaded accumulator mounted on the under side of an oil reservoir tank cover, so that the accumulator is enclosed within the tank. A pump and motor for developing the hydraulic pressure are mounted on top of the tank cover.

In Fig. 1, which shows a battery of three deep-hole drilling machines in one of the Nash automobile plants, the hydraulic unit is seen on the floor between the middle and the left-hand machines. The piping which connects all three machines to the hydraulic pressure unit can be clearly seen in this illustration. These machines are used for drilling 1/8-inch holes to a depth of 5 inches in two crankpins of crankshafts. One operator runs the three machines.

This hydraulic method of step-by-step drilling is being widely applied in the automotive industry for producing long holes of small diameter in crankshafts, connecting-rods, carburetor parts, etc. Fig. 3 shows a machine used for drilling twelve oil-holes in six crankpins of Lincoln-Zephyr crankshafts. The crankshaft is held in a fixture provided with an indexing means for successively positioning the different crankpins beneath the drill spindles. The drills are 1/8 inch in diameter and produce holes 1 inch deep. These crankshafts are cast from a high-carbon, high-copper, chromium-silicon steel and have a hardness of from 280 to 324 Brinell.

Considerably longer holes are produced by the machine illustrated in Fig. 2, which has a head at the rear positioned at an angle in the horizontal plane, as well as the angular head at the right. Both of the holes drilled are 3/16 inch in diameter and 3 1/2 inches deep. Two other deep-hole drilling machines, which are not illustrated, operate on these crankshafts, the four machines being tended by one man.

Fig. 4 is a close-up view of one of the machines in the Buick installation shown in the heading illustration. The two single-spindle heads of this triple-head machine drill 5/16-inch holes in crankpins Nos. 3 and 6 to a depth of 4 7/8 inches, while the two-spindle head drills 5/32-inch holes in the Nos. 4 and 5 crankpins. This crankshaft has a hardness of 186 Brinell. The six deep-hole drilling

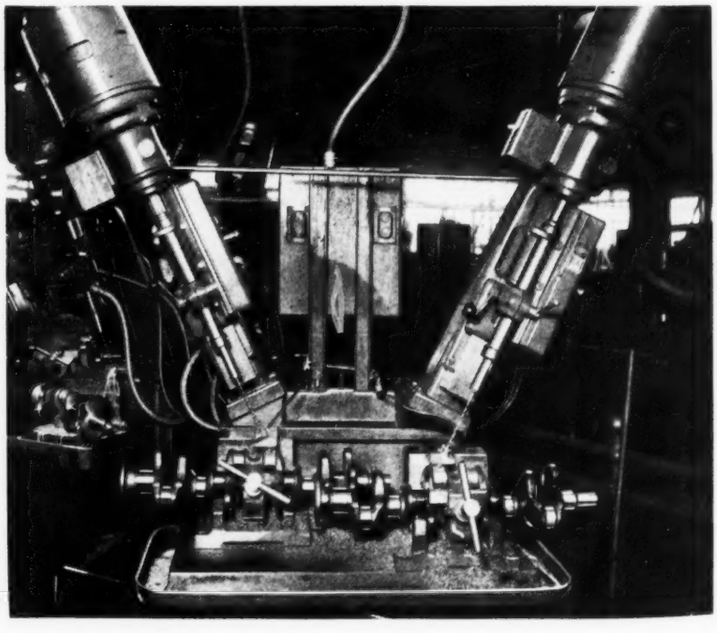


Fig. 7. Machine Equipped with Two Fixtures for Drilling the Nos. 3 and 4 Crankpins of Plymouth Crankshafts

machines in this installation are tended by two men.

Fig. 6 shows a six-spindle machine employed by the Packard Motor Car Co. to drill a hole that runs the entire length of connecting-rods from the bottom of the main bearing to the piston-pin bearing. Drills about 13 inches long and 7/32 inch in diameter are used to produce holes 6 3/16 inches long. About fifty pieces are drilled per grind of the drills.

Machines of the type illustrated in Fig. 7 are used in a number of plants. The particular machine shown drills a 1/4-inch hole to a depth of 4 3/4 inches in Nos. 3 and 4 crankpins of Plymouth crankshafts. Two fixtures are provided, crankpin No. 4 being drilled with the work in the right-hand fixture after which the work is transferred to the left-hand fixture for drilling the No. 3 crankpin. In another application of this type of machine, two oil-holes are drilled simultaneously in one crankshaft.

Deep-Hole Drilling in Other Industries

While most of the illustrations in this article pertain to operations in the automotive field, this deep-hole drilling method is applicable to a large variety of work in other industries. Fig. 5, for example, illustrates the drilling of an iron casting at the Whitin Machine Works, Whitinsville, Mass., manufacturers of textile machinery. A blind hole, 51/64 inch in diameter, is being drilled to a depth of 8 7/8 inches in steps of 1/2 inch. One operator runs four machines.

National Metal Trades Association Discusses Employe Relations

THE thirty-eighth annual meeting of the National Metal Trades Association, held in New York City, April 22 and 23, was attended by a large number of the leaders in the machine-building and metal-working industries.

One session was devoted entirely to an important report which the newly organized Committee on Employer-Employe Cooperation has been preparing. Henry W. Johnson, vice-president and works manager of the DeLaval Steam Turbine Co., Trenton, N. J., as chairman of this committee, presented the problem in definite and concise form. Howard Dunbar, manager of the Grinding Machine Division of the Norton Co., Worcester, Mass., a member of the committee, addressed the Association on the subject, "Need for Coordinated Effort." J. S. Knowlson, chairman of the board of directors of the Stewart-Warner Corporation, Chicago, Ill., also a member of the committee, spoke on "The Responsibility of Management in Employer-Employe Cooperation." Louis Ruthenburg, president of Servel, Inc., Evansville, Ind., another member of the committee, spoke on "The Direct and Indirect Benefits of an Employe Cooperation Program."

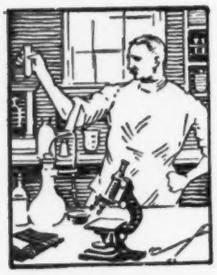
Moffett Studios

Charles H. Strawbridge, Newly Elected President of the National Metal Trades Association

Among other papers of importance presented at other sessions of the convention should be mentioned "What the Machine Has Done to Mankind," by Dr. James S. Thomas, president of the Clarkson College of Technology, and "The Need for Skilled Help and How to Meet It," by George A. Seyler, works manager of the Lunkenheimer Co., Cincinnati, Ohio. The legal aspects of recent legislation regulating business, the old-age security program, and present tax problems were other subjects that came before the meeting.

Charles H. Strawbridge, president of the Goodman Mfg. Co., Chicago, Ill., was elected president for the coming year; N. W. Pickering, of the Farrel-Birmingham Co., Inc., Ansonia, Conn., first vice-president; and A. H. Timmerman, of the Wagner Electric Corporation, St. Louis, Mo., second vice-president. Harold C. Smith, of the Illinois Tool Works, Chicago, Ill., was elected treasurer.

MATERIALS OF INDUSTRY



THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Molding Material of High Strength and Good Machining Qualities

A molding material developed especially for telephone handles, machine parts, etc., that must possess more than ordinary strength is being placed on the market by General Plastics, Inc., North Tonawanda, N. Y., under the trade name of Durez 1544. In addition to strength, parts made from this material can be readily machined. Machining, sanding, buffing, or wire-brushing can be performed without uncovering filler spots. When machined areas are buffed, a black finish of unusual smoothness and luster is obtained. The material weighs only 22.4 grams per cubic inch.

Steel Sheets and Plates of High Tensile Strength

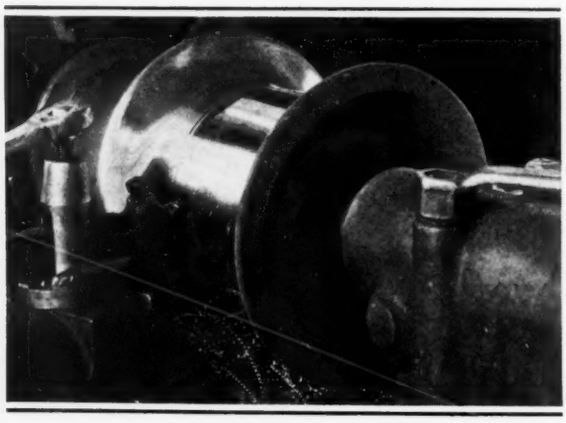
The American Rolling Mill Co., Middletown, Ohio, has recently developed a steel of high tensile strength which is being produced in thicknesses of No. 20 gage and heavier. This steel, which is known as Armco H.T.-50, has a tensile strength of 67,000 pounds per square inch in the hot-rolled grades and 70,000 pounds per square inch in the cold-rolled grades. The elongation of hot-rolled sheets is 28 per cent in 2 inches.

While the endurance limit of this steel is 48,000 pounds per square inch, the yield point is 47,000 pounds per square inch in the hot-rolled grades. It is pointed out by the company that few materials possess an endurance limit equal to or greater than the yield point.

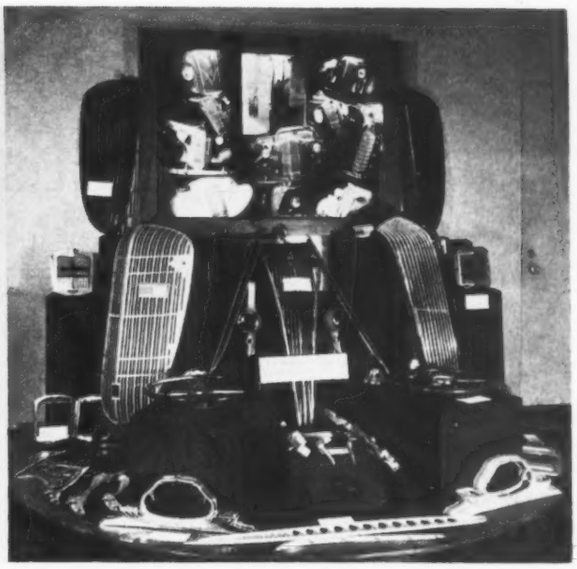
Tests show the impact tensile strength to be 5000 foot-pounds per square inch, which is nearly double that of mild steel. Care is exercised to avoid strength in excess of actual requirements, so as to permit the use of advanced methods of fabrication. To facilitate welding, the carbon content is confined to a low percentage. Finished welds closely approach the unwelded steel in physical properties. Sheets and plates of the new material can be welded with the so-called "shielded arc" electrodes. In addition to its other advantages, this new steel offers unusual resistance to atmospheric corrosion.

Comprehensive Exhibit Emphasizes Wide Use of Die-Castings

The exhibition of die-castings that opened at the Metal Products Exhibits, Inc., Rockefeller Center, New York City, March 16, under the sponsorship of the American Die-Casting Institute, has proved to be the most comprehensive exhibit of die-castings ever held in this country—or in the world. The exhibition, it is announced, will continue into the first week of May. Engineers, designers, and man-



A manganese steel cat-head being turned with Haynes Stellite J-metal. An oxy-acetylene flame is constantly played on the metal to be removed, in order to keep the steel in a workable condition. Its red hardness property enables the cutting tool to perform satisfactorily even under such severe heat conditions



Some of the Die-casting Exhibits Now to be Seen at Rockefeller Center, New York

ufacturers, both in New York City and vicinity, and those who have visited the city from other parts of the country, have found in this exhibit much of value and interest.

In cases where it is not possible to exhibit actual production methods of die-castings, large photographs are used to illustrate the production steps, while actual die-castings and assembled products illustrate many of the present-day uses of die-castings. A great number of modern consumer products (vacuum sweepers, clocks, toys, kitchen appliances, musical instruments, etc.) suggest the scope of die-casting applications. In addition, there is a large display of industrial equipment and automotive parts, store equipment, and novelties.

Molybdenum Makes Stainless Steel Resist Highly Corrosive Chemicals

Iron and steel were seldom used in the construction of chemical apparatus up to a few years ago, because they were subject to the action not only of acids and alkalies, but also of water and air. Then stainless steel was developed, which resisted ordinary chemicals and hence received wide application in this field. Later it was discovered that the addition of molybdenum to stainless steel made it resistant to the most highly corrosive chemicals, according to the Climax Molybdenum Co., 500 Fifth Ave., New York City. Molybdenum also inhibits the formation of chromium carbides due to welding.

For use with sulphites, there is a stainless steel known as 18-8-SMO, which has the following analysis: Carbon, 0.08 per cent maximum; manganese, 1.50 per cent maximum; phosphorus, 0.030 per cent maximum; sulphur, 0.030 per cent maximum; chromium, approximately 18 per cent; nickel, approximately 10 per cent; and molybdenum, approximately 3 per cent. This alloy has a tensile strength of 90,000 to 100,000 pounds per square inch, a yield point of approximately 45,000 pounds per square inch, an elongation of 50 per cent in 2 inches, and a reduction of area in excess of 60 per cent.

In a plant on the Pacific coast, parts made of this alloy have shown no sign of pitting after fourteen months, whereas parts made from ordinary 18-8 stainless steel pitted within eight months.

Die and punch made from a solid bar of 3-C die steel which is produced by the Jessop Steel Co., Washington, Pa. This die is used in manufacturing a staple for connecting the sides of chicken incubators. 250,000 pieces have been blanked with this equipment from 0.049-inch stock

Gear Manufacturers Consider Their Industry's Problems

At one of the best attended meetings of the American Gear Manufacturers' Association, held in Philadelphia, Pa., April 20 and 21, a broad variety of subjects of importance to the gear industry were discussed. One of the outstanding addresses was that of John W. O'Leary, president of the Machinery and Allied Products Institute, who spoke on "Industry's Place in the Events of Today." An abstract of this address will be published in a coming number of MACHINERY.

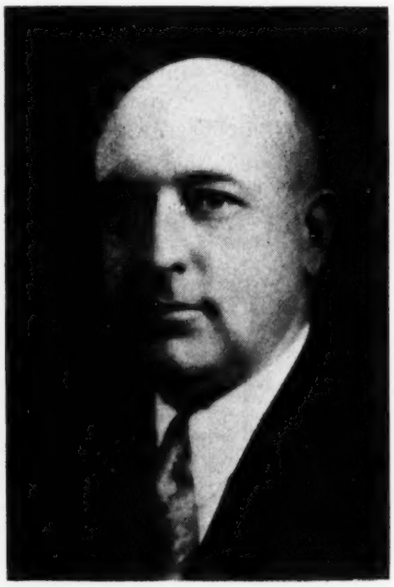
The meeting was opened by the president, A. A. Ross of the General Electric Co. George L. Markland, Jr., of the Philadelphia Gear Works, who is president of the Philadelphia Board of Trade, welcomed the members to the city. Mr. Markland emphasized the importance of recognizing the pitfalls into which we are being led by present-day economic doctrines. Said Mr. Markland: "Wealth is produced only by men who work at useful occupations. Money is not wealth. Only the things produced in industry and agriculture are wealth."

In a paper "Gear Noise—Causes and Corrections," W. E. Sykes of the Farrel-Birmingham Co., Inc., outlined in considerable detail and in a logical and comprehensive manner what causes gear noise and how it may be overcome. Ira Short, of the South Philadelphia Works of the Westinghouse Electric & Mfg. Co., presented a paper on "Marine Gearing." Everett Chapman, of Lukenweld, Inc., made an instructive address on "Cast Steel and Welded Plate Combination Gear Housings," and G. E. Katzenmeyer, of the National Erie Corporation, read a treatise on "A Standard Procedure in Determining the Size and Horsepower Capacities of Gears of Different Materials."

A comprehensive paper on "Hobs and Hobbing" was presented by S. M. Ransome, of the Barber-Colman Co. S. M. Weckstein, of the Timken Roller Bearing Co., gave a detailed review of "The Use of Tapered Roller Bearings in Gear Reduction Units," showing designs applicable in gear units.

The following members were elected to the executive committee to serve for a period of three years each: F. H. Fowler, of Foote Bros. Gear & Machine Co.; J. H. Flagg, of the Watson-Flagg Machine Corporation; Charles Goedke, of the Ganschow Gear Co.; and W. G. Jones, of W. A. Jones Foundry & Machine Co. E. S. Sawtelle, president of the Tool Steel Gear & Pinion Co., Cincinnati, Ohio, was elected president of the Association for the coming year; H. H. Kerr, president of the Boston Gear Works, Boston, Mass., was elected vice-president; and J. H. Jackson, of the Pittsburgh Gear & Machine Co., Pittsburgh, Pa., treasurer. J. C. McQuiston, of Wilkinsburg, Pa., continues as manager-secretary.

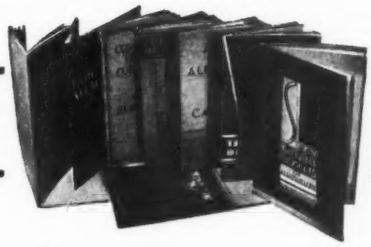
E. S. Sawtelle, Recently Elected President of the A.G.M.A.



H. H. Kerr, Newly Elected Vice-president of the A.G.M.A.

A. A. Ross, Retiring President of the Association

NEW TRADE LITERATURE



Recent Publications on Machine Shop Equipment, Unit Parts, and Materials. Copies can be Obtained by Writing Directly to the Manufacturer.

Welding Supplies and Equipment

LINDE AIR PRODUCTS CO., 30 E. 42nd St., New York City. Booklet on the oxy-acetylene welding of brass and bronze. The first part of the book is devoted to the technique of the fusion welding of brass and bronze giving information on correct flame adjustment for different alloys, and welding procedure. The second part of the book deals specifically with the welding of commercial yellow brass pipe. Joint design and welding technique are discussed in detail. Three tables give data on welding time, material consumption, and tensile strength of welds made in various positions.

Welding Equipment

EISLER ENGINEERING CO., 752 S. 13th St., Newark, N. J. Booklet 36W, entitled "Electric Welding Machines and Welding Tips," containing 64 pages of information on resistance welding equipment. The booklet is profusely illustrated with photographs and diagrams showing welding machines, fixtures, and tips designed to meet a wide variety of welding problems. Many new types of welding equipment developed by the company are shown, including a new line of box type spot-welders. Executives or engineers interested in welding applications will find many valuable suggestions in this book.

Control Equipment

REEVES PULLEY CO., Columbus, Ind. Booklet T-361, on the subject of automatic speed regulation of industrial production machines and conveyors. The booklet begins with a discussion of the need for automatic production control; tells how automatic regulation is accomplished through the use of one of four types of Reeves controls in connection with the Reeves variable-speed transmission; describes the four controls—hydraulic, mechanical, electric, and differential—and shows how they may be connected and used to meet specific requirements in many different industries.

Leather Belting

E. F. HOUGHTON & CO., 240 W. Somerset St., Philadelphia, Pa. Leather belting manual entitled "How to Belt Your Drives for More Profit," containing transmission data, engineering tables, and simple belt formulas. The booklet is replete with information of value to the belt man, including such material as the selection and care of leather belts; how to make the belts endless on pulleys; types of lacings; cementing instructions; belt preservatives; etc. It also contains a complete description of the various types of belting made by the company.

Files

HENRY DISSTON & SONS, INC., 506 Tacony, Philadelphia, Pa. Folder entitled "Disston Files—Their Selection and Care," containing a great deal of useful information on files and filing, including a brief review of the methods used in file-making, dimensions of files in general use, standard cuts of different types of files, a classification of files according to their shape and use, and directions and illustrations showing how to use a file. The illustrations shown of some of the most used files aid in recognizing and identifying files that are known by different names.

Draw-In Collets and Chucks

RIVETT LATHE & GRINDER, INC., Brighton, Boston, Mass. Bulletin 100-B, illustrating and describing Rivett draw-in collets and chucks. The bulletin also contains a table of dimensions and capacities for the different styles of collets and chucks made by the company, as well as a list of the styles especially suitable for different standard makes of machine tools. Other products of the concern to which attention is called include lever chuck closers, jaw chucks, internal grinding wheel chucks, drill chucks, and collet attachments.

Welding Equipment

LINCOLN ELECTRIC CO., Cleveland, Ohio. Bulletin entitled "A Guide to Lower Tooling Costs with Shielded Arc-Welded Steel Jigs and Fixtures." The pamphlet points out why the shielded arc-welding process is especially suitable for tooling and shows illustrations of typical welded-steel jigs and fixtures. It gives comparative data on the cost of cast-iron and welded-steel construction and contains information on how to equip the tool-room for shielded arc welding.

Chucks

JACOBS MFG. CO., Hartford, Conn. Bulletins 1 to 9, giving data on Jacobs chucks, including methods of fitting the chucks to various machine spindles, dimensions and price lists of the various models, and applications and characteristics. The different types of chucks covered include plain bearing chucks, ball-bearing chucks, keyless type "Portomatic" chucks, positive-drive tap chucks, single-purpose chucks, and lathe chucks.

Socket Set-Screws and Cap-Screws

HOLO-KROME SCREW CORPORATION, Bristol, Conn. Catalogue HK-166, containing the standards for hexagonal type socket set-screws and cap-screws approved by the American Standards Association and sponsored by the Society of Automotive Engineers and the American Society of Mechanical Engineers. The book gives complete dimensions for the heads, bodies, screw and thread lengths, screw points, sockets, and wrenches.

Anti-Friction Bearing Units

LINK-BELT CO., 307 N. Michigan Ave., Chicago, Ill. Catalogue 1520, on Link-Belt anti-friction bearing units, available in streamline pillow block, hanger, take-up, flanged, duplex, and special mountings. Five distinct types of bearing units are covered, known as Series 100, 400, 500, 600, and 900. Series 100, 500, and 600 are entirely new. Series 100 is a self-aligning ball-bearing unit, and the others are of the roller-bearing type.

Tool Reconditioning

EASTERN CUTTER SALVAGE CORPORATION, 30-32 Littleton Ave., Newark, N. J. Catalogue A, describing the service offered by this concern in tool salvaging and reconditioning. Specific examples of reconditioned milling cutters, drills, reamers, pneumatic tools, and files are shown, as photographed in actual service in various plants. The catalogue gives an excellent idea of the savings that can be effected by this process.

Roller Bearings

TIMKEN ROLLER BEARING CO., Canton, Ohio. New edition of the mine car and mine locomotive section of the Timken Engineering Journal. The new supplement presents a complete listing, with mounting diagrams and tabular data from which bearing sizes can be selected for any loading, for all types and classifications of mine cars ranging in capacity from 1 1/2 to 35 tons.

Indicating and Controlling Instruments

BRISTOL CO., Waterbury, Conn. Catalogue 1250, containing 88 pages on liquid-filled, vapor-tension, and gas-filled recording, indicating, and controlling thermometers. Information is given on both electric and pneumatic automatic temperature controllers. Over five hundred temperature recording charts are reproduced full size.

Pipe Threading and Cutting Off Machines

LANDIS MACHINE CO., INC., Waynesboro, Pa. Bulletin C-82, illustrating and describing the "Little Landis" semi-portable pipe threading and cutting machine which is designed for use in jobbing and maintenance shops. The distinctive features of design and construction are described, and specifications are included.

Nickel Alloys for Gears

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York City. Folder entitled "Nickel-Alloy Gear Materials and Their Heat-Treatments," describing how, by the addition of nickel to cast iron, steel or bronze, a material is produced that is better able to resist the complex strains, stresses, and shocks inherent in gear drives.

Die-Heads

EASTERN MACHINE SCREW CORPORATION, 23-43 Barclay St., New Haven, Conn. Bulletin describing the construction and advantages of the H & G Style DM insert-chaser die-heads for Brown & Sharpe automatic screw machines. Tables giving the principal dimensions, capacities, and carrier ranges of these die-heads are included.

Heat-Treating Equipment

LEEDS & NORTHRUP CO., 4921 Stenton Ave., Philadelphia, Pa. Folder entitled "How Disston Improved the Hardening of High-Chrome, High-Carbon Tools," describing how the triple-control, Hump hardening process increased the efficiency of the heat-treatment in a tool-manufacturing plant.

Woodworking Machines

YATES-AMERICAN MACHINE CO., Beloit, Wis. Catalogue 359, entitled "Woodworking Machines for Home, School and Industry," illustrating and describing an entire line of woodworking lathes, drilling machines, jig saws, jointers, circular saws, grinders, sanders, and accessories.

Air Compressors

ALLIS-CHALMERS MFG. CO., Milwaukee, Wis. Engineering leaflet 2218, on the Allis-Chalmers recently announced "Ro-Twin" compressor. The bulletin describes and illustrates this new development in rotary compressor design, giving specifications, table of capacities, and approximate dimensions.

Portable Cable

GENERAL ELECTRIC CO., Schenectady, N. Y. Bulletin GEA-1918A, giving complete data and listings of all types of tellurium all-rubber, Glyptal compound, and braided types of portable cable for welding, transit, and mining equipment, electric shovels and dredges, and similar apparatus.

Ball Bearings

NORMA-HOFFMANN BEARINGS CORPORATION, Stamford, Conn. Bulletin F-951, describing the construction and outstanding advantages of the Norma-Hoffmann Cartridge precision ball bearing, a self-sealed type of bearing. Tables of dimensions, load ratings and mounting data are included.

Industrial Ovens and Dryers

GEHNRICH CORPORATION, Long Island City, N. Y. Catalogue 101 of industrial ovens and dryers for baking japan, enamel, lacquer, varnish, and synthetic resin finishes; core-baking and mold-drying; low-temperature metal heat-treating; and many other industrial heating processes.

Hydraulic Power Units

EX-CELL-O AIRCRAFT & TOOL CORPORATION, 1200 Oakman Blvd., Detroit, Mich. Bulletin illustrating and describing the features of the Ex-Cell-O multi-purpose hydraulic power units designed to provide an economical method of drilling, reaming, countersinking, or spot-facing.

Cold-Rolled Steel

UNION DRAWN STEEL CO., Massillon, Ohio. Folder entitled "First in Speed of Machining and in Quality of Machined Finish," illustrating and describing a variety of parts produced from "Union Supercut," cold-rolled steel in automatic screw machines.

Indicating and Recording Instruments

H-B INSTRUMENT CO., 2518 N. Broad St., Philadelphia, Pa. Blue Book Part 3, describing this company's complete line of industrial indicating and recording thermometers for accurate temperature readings.

Drives for Agitators

PATTERSON FOUNDRY & MACHINE CO., East Liverpool, Ohio. Folder entitled "Agitating Equipment by Patterson," featuring various types of agitators and the various kinds of drives with which they are supplied.

Electric Screwdrivers

INDEPENDENT PNEUMATIC TOOL CO., 600 W. Jackson Blvd., Chicago, Ill. Circular descriptive of a small portable electric screwdriver having a capacity for driving all sizes of screws from No. 4 to No. 12.

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Bliss Automatic High-Production Presses

Automatic power-press feeds were formerly considered practical only for comparatively small work, but the E. W. Bliss Co., Toledo, Ohio, has now applied automatic feeds to a line of high-production multiple-crank presses built for blanking the large steel sheets required in the fabrication of all-steel automobile bodies. One of these presses is shown in Fig. 1. This machine is equipped with a twin-gear drive, the main gears operating in a sealed oil bath. The flywheel runs in Timken roller bearings. This press is controlled by means of a multiple-disk, air-operated friction clutch, located in the flywheel, and a disk brake. Electric push-buttons provide for constant running, inching, starting, and stopping.

A 12-inch stroke is imparted to the slide by two double cranks, there being a connection to each of the four corners of the slide so as to hold it in true alignment. The slide is counterbalanced by air cylinders, cast integral with the crown.

This press measures 136 inches between the uprights, has a bed area of 60 by 136 inches, and weighs approximately 150,000 pounds. A similar machine measuring 210 inches between the uprights is now being built by the concern, and presses measuring 100 and 120 inches have also been constructed.

The double roll-feed supplied on all of these presses is substantially the same, except for the length of the feed, which is in proportion to the distance between the uprights. The feed on the press illustrated is capable of handling sheets up to 50 inches wide, feeding and discharging them through the uprights. The stock comes in coils weighing as much as 15 tons. These coils are mounted on a power-driven cradle. The feed-rolls of the press pass the stock through a power-driven straightener on the right-hand side and advance it over the dies and under a scrap-cutter on the left-hand side. The stock can be advanced to the dies in increments up to 100 inches, and the press can be operated continuously at about 13 strokes a minute.

Fig. 3 shows another high-production double-crank press. This style of press is intended for producing automobile hub caps and similar work requiring a number of successive opera-

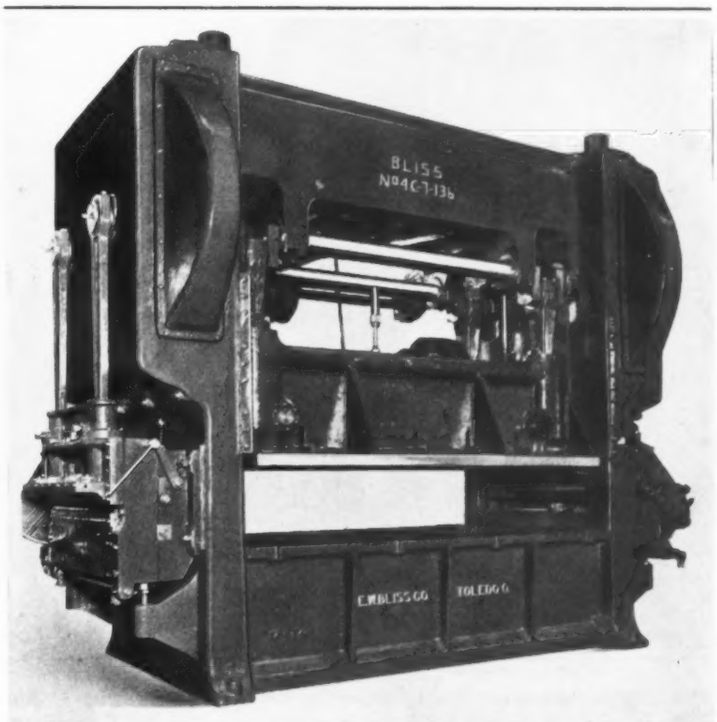


Fig. 1. Bliss High-production Press of the Type Used in Blanking Large Sheets for All-steel Automobile Bodies, Equipped with an Automatic Feed and Scrap-cutter

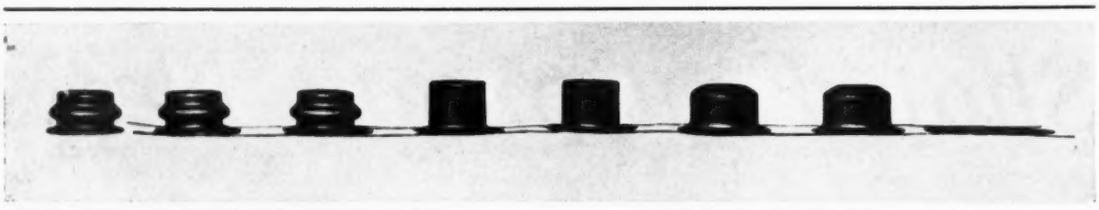


Fig. 2. Eight Successive Operations Performed in Making Automobile Hub Caps

tions. In this machine also, stock is drawn from a coil mounted on a cradle and is passed through a power-driven seven-roll straightener. From the straightening rolls, the stock is fed successively through the various dies, after which the stock is carried by the rolls at the left through a scrap-cutter (not shown).

Fig. 2 shows the eight successive steps performed in producing the hub caps. The press runs continuously at 20 strokes a minute, a cap being finished at each stroke. The air-counterbalanced slide has a stroke of 16 inches. The bed of this press measures 42 by 72 inches, and the machine weighs about 100,000 pounds. Stock up to 15 inches wide can be fed in lengths up to 15 inches at a time.

The single-crank press illustrated in Fig. 4 exerts a pressure of approximately 200 tons at the bottom of its stroke. This press operates at 100 strokes a minute, running continuously, and is particularly intended for small and comparatively heavy blanking and coining operations. Automobile brake-band retainers constitute a typical job. The stock is carried through this machine by automatic feeds similar to those on the presses already described. The slide has a stroke of 2 1/2 inches, and the bed is 36 by 28 inches. The weight of the press is 40,000 pounds.

The concern has also built recently a special single-crank press, mounted on inclined legs and provided with an automatic high-speed double roll-feed and a scrap-shearing attachment. The slide of this machine has a

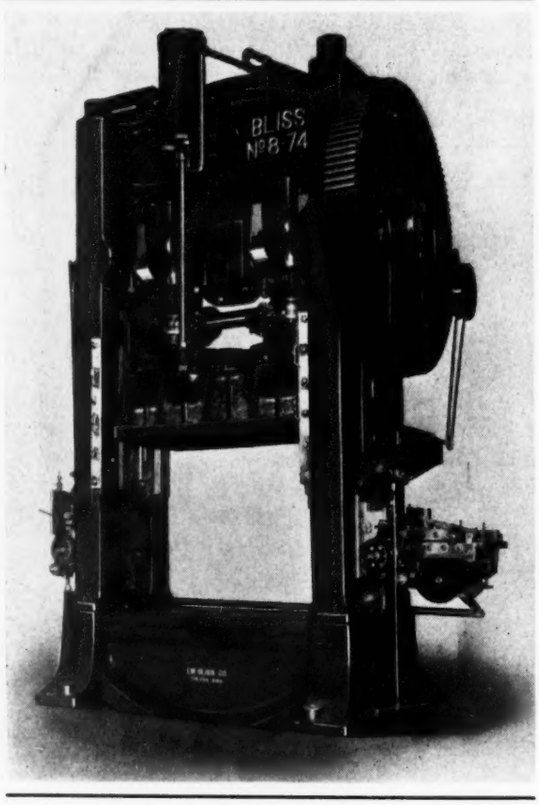


Fig. 3. Automatically Fed High-production Press Designed for Performing a Series of Operations

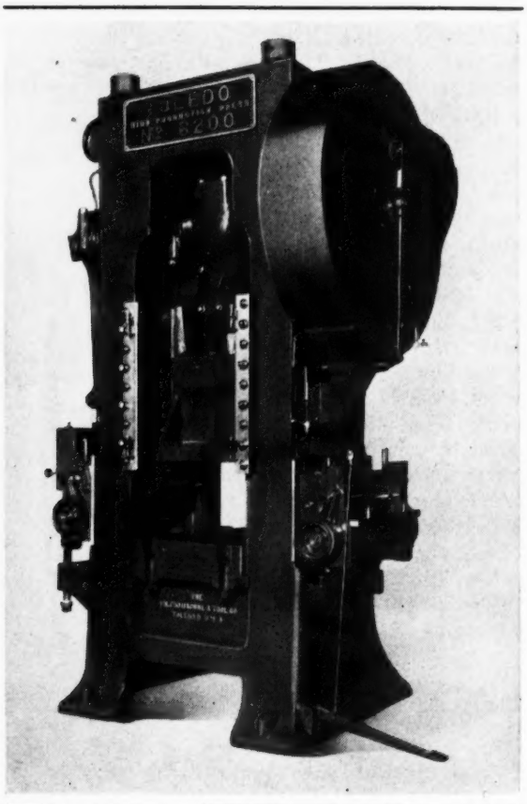


Fig. 4. Single-crank Press for Performing Heavy Blanking and Coining Operations on Small Work

stroke of 3 inches, and the bed is 17 inches square. This press weighs about 25,000 pounds.

In order to operate this press at from 80 to 100 strokes a minute, it is equipped with a direct-geared drive from a 15-horsepower motor. The drive includes a long-hook, rolling-key clutch, with a locking pawl and releasing brake. A timing ring in the clutch insures full engagement of the rolling key. This machine is provided with a roll-feed handling stock up to 5 inches wide.

Presses of the types here described relieve the operators of much heavy lifting that was heretofore necessary. For example, assume that a blank 7 1/2 inches in diameter by 1/2 inch thick and weighing about 6 pounds is formed into a shallow shell at the rate of fifteen a minute. If the press is not equipped with an automatic feed, the operator must lift, with his hands, 90 pounds of steel a minute, or nearly 22 tons during an eight-hour day. With an automatic feed, this heavy labor is avoided.

Gorton Three-Dimensional Die- and Mold-Cutting Machines

Three-dimensional machines of medium and small sizes have been added to the line of pantograph type engraving machines built by the George Gorton Machine Co., 1109 Thirteenth St., Racine, Wis. These machines are adapted for cutting all kinds of die-casting dies; glass, plastic, and rubber molds, etc. They reproduce in a reduced ratio direct from models of any shape or contour. The models may be made of stone composition, Bakelite, hard wood, etc., or metal templets may be used. The reproduction ratios range from one-half to one-eighth the size of the model or master.

One of the unusual features of these machines is that the cutter-spindle and tracer are always truly vertical in relation to the work. Also, the depth of cut is not obtained by hinging the pantograph, a method that results in an under-cut on one side of a deep mold. A uniform pressure of the tracer is maintained against the model in all pantograph positions, the design eliminating the need of a counterweight for balancing the pantograph. This construction provides easy operation, because the operator does not have to lift and hold the pantograph.

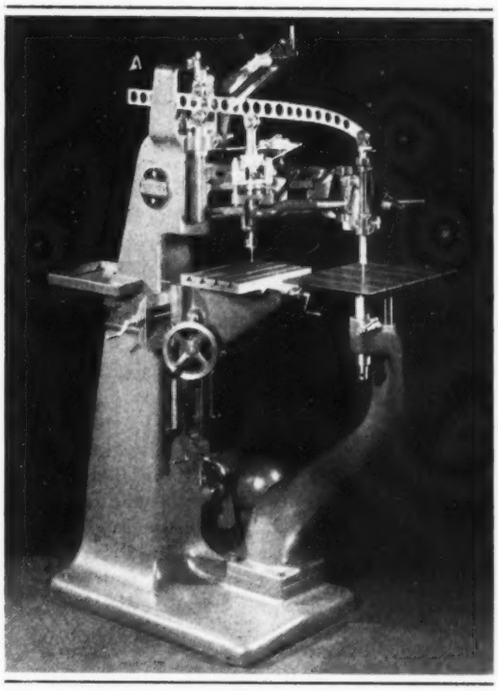
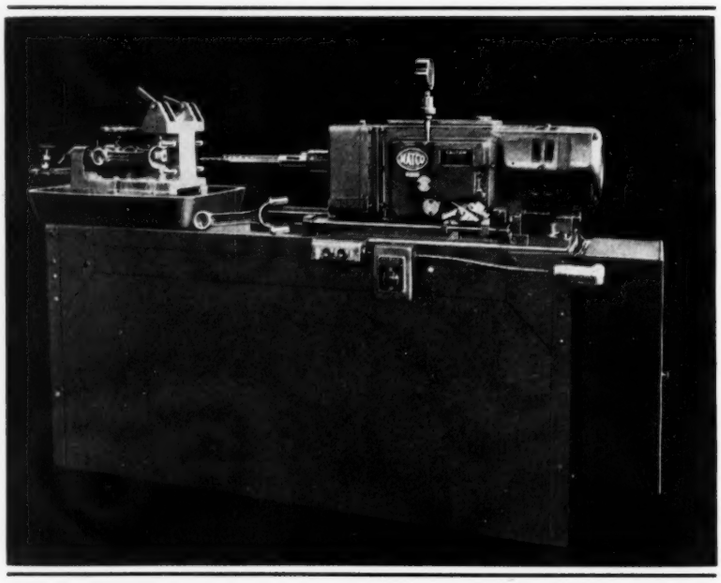


Fig. 1. Gorton Three-dimensional Machine for Cutting Dies and Molds from Templets

Fig. 2. Gorton Medium Size Three-dimensional Machine for Engraving and Die Work

The small 3-B machine, shown in Fig. 1, will cut a cavity up to 6 by 12 inches in one setting. Larger work can be handled by resetting. The machine takes cutters up to 1/4 inch in diameter, has six spindle speeds from 3800 to 9900 revolutions per minute, and is driven by a 1/4-horsepower motor. The medium size 3-L machine, shown in Fig. 2, will cut cavities up to 9 by 18 inches in one setting. This machine takes cutters up to 3/8 inch in diameter, has nine spindle speeds ranging from 1100 to 9200 revolutions per minute, and is driven by a 1/2-horsepower motor.



Natco Hydraulic Step Drilling Machine, Especially Designed for Producing Long Oil-holes in Connecting-rods

Natco Deep-Hole Drilling Machine

The illustration shows a machine recently built by the National Automatic Tool Co., Richmond, Ind., for drilling oil-holes of 5/16 inch diameter, 7 1/2 inches deep, through forged chrome-nickel steel motor-truck connecting-rods. The production on this operation is ten rods an hour, whereas with the previous method of drilling, the time required was 25 minutes per connecting-rod. The machine thus has increased production over 400 per cent.

The machine is equipped with a Holeunit motor-driven hydraulic head, arranged with a deep-hole drilling mechanism which causes the Holeunit to withdraw the drill at predetermined time intervals. This method prevents the clogging of chips at the drill point, eliminates excessive heat, prolongs the life of the drill cutting edges, and facilitates the drilling of straight holes.

The Holeunit is equipped with a two-spindle box and a stationary fixture holding two connecting-rods. Step drilling operations are performed simultaneously on the two rods. Machines of various styles have been built by the concern for the deep-hole drilling of a variety of parts by applying the same principle.

Starrett Molybdenum Steel Hacksaw Blades

Recently developed heat-treating methods have been applied to hard, long-wearing molybdenum steel in producing a new hacksaw blade, known as the "SM," recently added to the line of the L. S. Starrett Co., Athol, Mass. This new saw is intended for fast, economical cutting of nickel; Monel metal; stainless steel alloys; high-speed, manganese, or tool steel; phosphor bronze; and similar hard alloys. It is recommended for use in cutting solids, angles, channels, pipe, rails, and similar shapes.

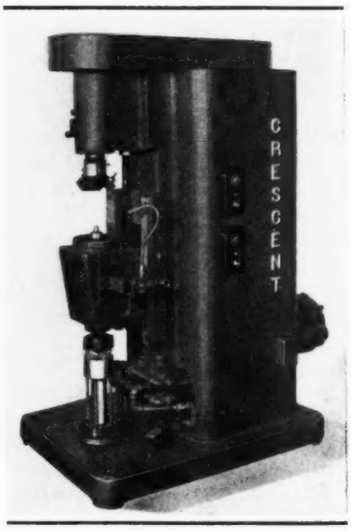
The saws are made in 10- and 12-inch lengths, and with 14, 18, 24, and 32 teeth per inch for hand frames. Power blade sizes are made in lengths of 12, 14, 17, 18, 21, and 24 inches, and with 4, 6, 10, and 14 teeth per inch.

Crescent Burring Machine

A hydraulically operated machine for removing the flash left on drop-forgings after trimming and piercing operations has been brought out by the Crescent Machine & Tool Co., 1104 Tenth St., Rockford, Ill. This machine is equipped with a cutter-head that removes burrs from the hole in a part and also from the periphery of the flange in one operation. The work is placed on the expanding mandrel located on top of the machine knee. The foot-operated valve is then depressed, causing the hydraulic cylinder to raise the knee and clamp the work.

The speed of the upward feeding movement is retarded when the work is within 1/2 inch of the cutter. The cutter completely removes the burr in three or four revolutions, after which the operator releases the valve, allowing the knee to descend and unlock the work.

The machine has a capacity for burring holes from 3/4 inch to 3 inches in diameter, and flanges up to 3 1/4 inches in diameter. The cutter-head is driven by a 3/4-horsepower, geared-head motor and the hydraulic pump by a 1 1/2-horsepower motor.



Crescent Hydraulically Operated Burring Machine

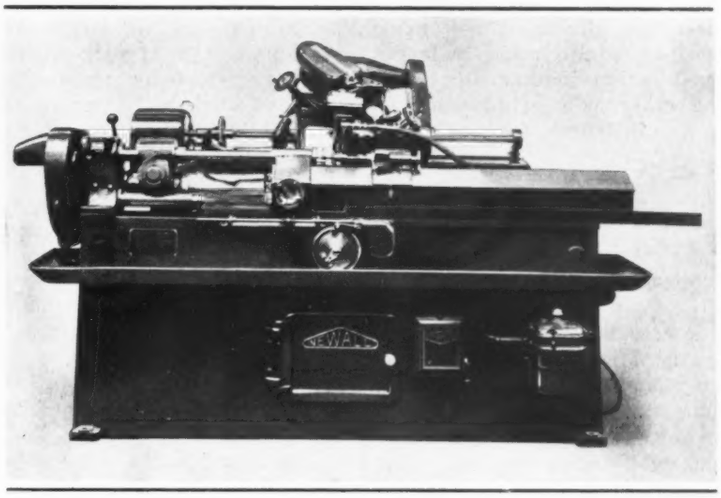
Eisler Box Type Welders

Fabricated box type welders designed for greater production and higher operating efficiency have been brought out recently by the Eisler Engineering Co., 770 S. 13th St., Newark, N. J. These machines, one of which is shown in the illustration, are made in 35 to 250 kilovolt-ampere sizes, with throat depths ranging from 12 to 36 inches. They are intended for intermittent or production welding of sheet-metal of varying thickness.

They may be equipped for foot operation, in which case the electrodes are brought down on the work by foot pressure; or they may be motor-driven. In the latter case, the speed can be changed to give from 30 to 100 welds per minute. The machines can also be arranged for operation by compressed air.

Various types of special electrodes and spot-welding jigs and fixtures designed by the manufacturers of the machines can be fitted to the work-holding arms for welding at various angles, in corners and in places that are not readily accessible. Controls for adjusting the heat, pressure, and welding time are conveniently located.

Eisler Welder Built in 35 to 250 Kilovolt-ampere Sizes



Newall Automatic Universal Thread Grinder Built by the Reed-Prentice Corporation

Newall Automatic Universal Thread Grinder

Precision threads with the pitch error controllable within 0.0001 inch can be ground on taps, gages, dies, chasers, bolts, etc., with the Newall automatic universal thread grinder manufactured by the Reed-Prentice Corporation, Worcester, Mass. Accuracy and speed are features of this machine, which is designed to take a series of light cuts at a high speed. With this method of grinding, the strains which are always present in hardened work are released gradually. Drawing of the temper is avoided, there is less wheel wear, and consequently the wear on the truing diamond is held to a minimum.

A cam arrangement provides for grinding the relief on taps and for relieving straight and spiral flutes of any number. A patented diamond truing device with direct and positive control by an enlarged thread form operating on the pantograph principle is one of the main features of the machine. A stylus is traced around an enlarged thread templet causing the diamond to reproduce the exact thread form required on the wheel. A projector is used to obtain an enlarged profile of the diamond, from which the stylus is made. Dressing of the wheel can be done without removing the work or upsetting the adjustment of the machine.

The lead-screw is 2 inches in diameter and has a hardened and ground thread. Provision is made for grinding right- and left-hand threads. A pitch correcting device is provided which permits the work to be ground to very fine limits. When desired, fine variations from standard pitches can be obtained. Indexing of the work when grinding multi-threads or annular grooves is obtained by a ground worm which actuates an accurately cut worm-wheel. The wheel-head is driven by a two-speed, alternating-current motor.

Twelve work speeds are obtained through cone pulleys; when required, a back-gear can be used to double the number of speeds. The automatic reverse is at a fixed high-speed rate independent of the cutting speed. The traverse motion is obtained from hydraulically actuated clutches designed to operate with exceptional smoothness, even at high speed. The wheel-head slide, motor, and dresser can be swiveled in a cradle to the right or left by means of a dial graduated to a helix angle of 15 degrees.

The machine is made in two

sizes, one of which will grind work up to 10 inches in length by 3 inches in diameter, while the other will grind work 36 inches in length for a distance of 20 inches. The larger size machine will grind work of short lengths up to 6 inches in diameter and work of longer lengths up to 4 inches in diameter.

Gear Speeder Developed by Michigan Tool Co.

A gear speeder designed to duplicate actual operating conditions in testing gears for quietness has been brought out by the Michigan Tool Co., Detroit, Mich. Pairs of production gears can be run together, both forward and reverse and under load, while being checked. This is possible because the speeder is provided with two spindles, each equipped with its own drive and brake, all controlled through a single handwheel.

Revolving the handwheel a quarter turn in one direction applies power to one spindle, while another quarter turn applies the brake to the opposite spindle. Returning the handwheel to the "neutral" position and continuing a quarter turn in the opposite direction applies the drive to the second spindle, while another quarter turn serves to apply the brake to the first spindle. The condition of reverse loads, as obtained in automobile transmissions, etc., can thus also be duplicated and hence gears can be checked for quietness in both forward and reverse operation, in a single set-up.

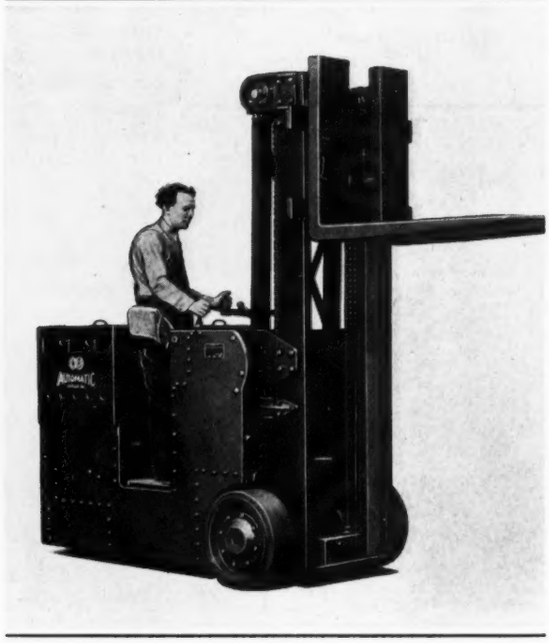
The rear spindle takes gears up to 14 inches in length, and the front spindle accommodates gears up to 17 inches in length, thus providing for the largest size gear clusters. Center distances are adjustable from 2 5/8 to 5 3/4 inches, which permits testing gears up to 8 1/2 inches in diameter. Both spindles are provided with a 1 1/2-inch hole to receive the shanks of stem gears. The machine is adaptable to the routine checking of gears in regular production, as an assurance against variations introduced during the heat-treatment of different lots of gears or through errors in the final finishing of gear bores, etc.

The use of a gear speeder makes it unnecessary to check production gears continuously for eccentricity, involute, helix angle, spacing, etc., unless a run of noisy gears is encountered, when a closer check of these elements becomes necessary to determine the cause of noisiness.

Tiering Fork Truck with Center Control

The Automatic Transportation Co., 101 W. 87th St., Chicago, Ill., has brought out a tiering fork truck of 10,000 pounds capacity that will handle loads up to 72 inches long. One of the features of this truck is a center control claimed to permit the shortest turning radius of any fork truck of the same capacity; the truck can be operated in 94-inch intersecting aisles. The front wheel drive is claimed to provide the highest traction on

Michigan Gear Speeder which Duplicates Operating Conditions in Testing Mating Gears



Tiering Fork Truck with Center Control which Enables a Short Turning Radius

ramps and slippery floors. The operator is fully protected, and at the same time has an unobstructed vision.

This truck is especially adapted for the rapid handling of bundled steel or for the transportation of other bulky material.

Bethlehem Abrasive Cut-Off Machine

An abrasive cut-off machine with sufficient capacity for most requirements is being introduced on the market by the Bethlehem Foundry & Machine Co., Bethlehem, Pa. This machine is of the universal type, as it can be operated both with a chop-cut stroke and a draw-cut stroke. Either one or a combination of both strokes can be used on a job. By making combined strokes, structural angles or channels can be cut with one set-up. On the other hand, such work as bars, strip stock, tubes, piping, and cable can be cut off with one downward stroke.

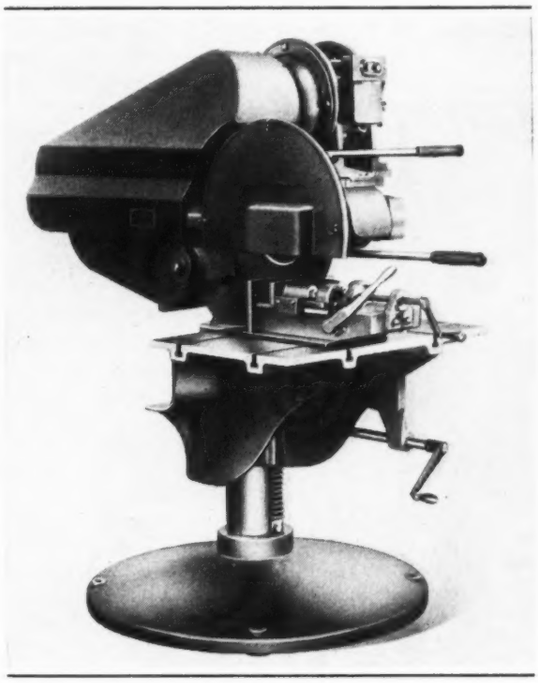
This machine is not limited to cutting at right angles to the work; it will cut at any required angle. When it is desired to cut heavy work, such as castings that cannot be supported on the table, the head can be swung away from the table for this purpose.

Cold-rolled steel, non-ferrous metals, and various materials, including cinder blocks and brick, can be cut dry. With an auxiliary coolant system, the machine is adaptable for the wet cutting of all types of stone, concrete, porcelain, and tile. Through the use of a trough in which the work is submerged, the machine is adaptable for cutting high-speed and other alloy steels, glass, synthetic plastics, rubber, and semi-precious stones. The accuracy of the operation is such that pieces are cut to size and require no further finishing.

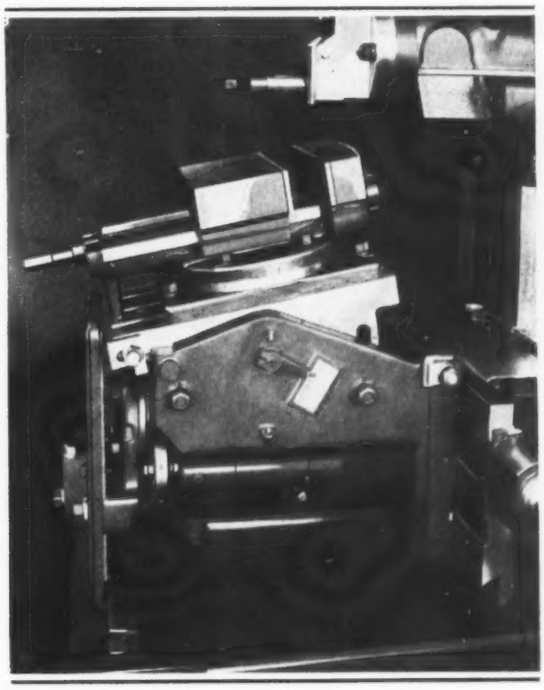
Ohio Universal Shaper Table

The universal shaper table here illustrated is a recent development of the Ohio Machine Tool Co., Kenton, Ohio. The entire table unit can be revolved a full 360 degrees on a trunnion, and the tilting top is adjustable 15 degrees either way from the horizontal position, on an axis located at right angles to the trunnion. The unit is also equipped with a solid top located 90 degrees from the tilting top.

The table is rotated by worm-gearing. The angular setting can be read on a large graduated dial at the front of the table. A table stop is provided for the 90-degree position which brings the solid top under the ram. Both the solid top and the tilting top have three T-slots. The tilting top has a graduated dial and pointer and a solid stop for accurate location in the horizontal position. The tilting movement is obtained through self-locking worm-gearing. Bolts are provided for clamping the tilting top. The table can be equipped



Abrasive Cut-off Machine Designed to Permit Universal Strokes



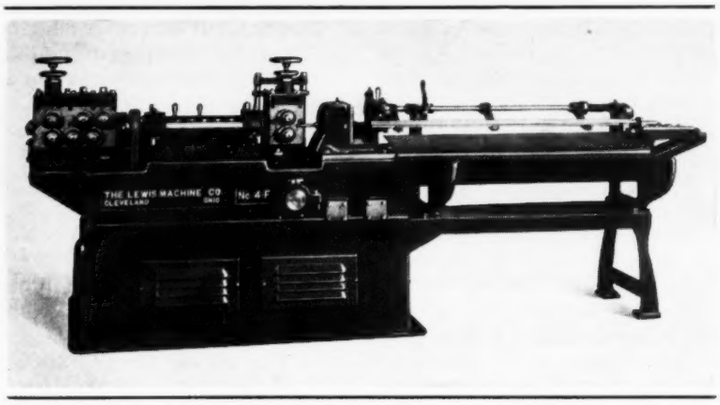
Universal Shaper Table Developed by the Ohio Machine Tool Co.

with or without a support. An automatic compensating and equalizing jack keeps the table in accurate alignment and lessens wear on the rail bearing. This equipment is sold by the Bryant Machinery & Engineering Co., Chicago, Ill.

Lewis Wire-Straightening Machine

An automatic wire straightening and cutting machine, which in general appearance resembles the model described in July, 1933, MACHINERY, page 740, has been brought out by the Lewis Machine Co., 1592-1600 E. 24th St., Cleveland, Ohio. This new machine feeds the wire from a coil, straightens it, gages it to accurate length, and cuts it without stopping the feeding movement, producing a rod or wire that is of uniform diameter throughout its entire length and free from roll marks. The cut-off die is fastened in a head that moves forward with the wire during the cutting operation. The cutting knife is operated by means of a quick-action cam on the flywheel shaft.

This machine is designed to take hardened iron, bronze, babbitt, or any type of straightener die best suited for the wire to be handled, and is particularly adapted for precision work on bright finished steel, bronze, aluminum, and alloy wire. The machine is driven by V-belts from a double-step pulley on the motor, which is mounted in a closed steel base. One set of belts drives the rotary straightener arbor, while another set drives the transmission. Feeds and flywheel speeds best suited to the wire to be straightened and cut are obtained by simply shifting levers.

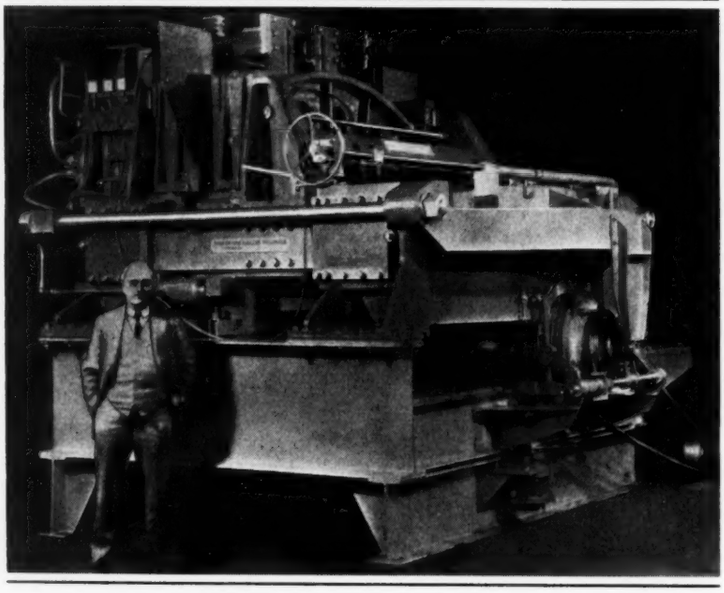


Wire Straightening and Cutting Machine Made by the Lewis Machine Co.

Thomson-Gibb Flash Welder for Sheet Steel

Increased production, reduced waste, and greater uniformity of product are advantages claimed for a resistance flash welder developed by the Thomson-Gibb Electric Welding Co., Lynn, Mass., for joining sheet steel or "bright stock" for continuous processing. Sheets can be joined into a continuous strip that can be pickled and processed without interruptions, thereby preventing any variations in the size and finish of the sheets.

The sheets are first sheared square. The trimmed ends of two sheets are lined up by gages in the welder and, at the touch of a control button, are clamped in place while the current goes on and off. As soon as the weld is completed, the strip moves along until the joint reaches a trimmer, where the burr is removed from the top and under sides by a pull shear. Succeeding sheets are joined to each other in the same manner. Once the burr is removed, the sheet passes readily under reduction rolls and is eventually rolled down until the welded joint becomes indiscernible. The joint thus produced is said to have the full strength of the material.



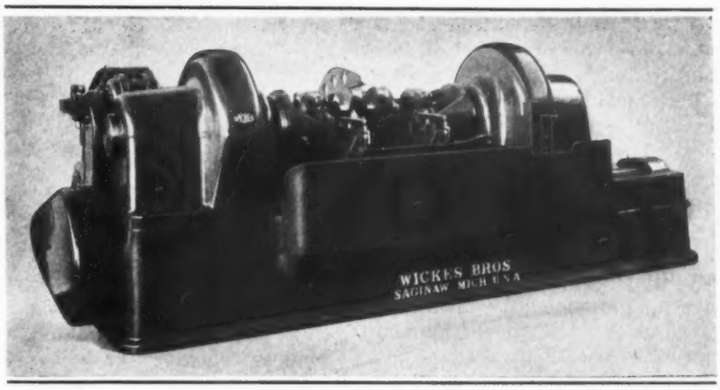
Thomson-Gibb Electric Welding Machine for Joining Steel Sheets to Permit Continuous Processing

Wickes Duplex Lathe for Heavy Crankshafts

An automatic machine designed especially for machining heavy Diesel-engine and tractor crankshafts has been developed by Wickes Bros., Saginaw, Mich. The automatic cycle of this lathe includes a rapid traverse of the tools into the cutting position, a coarse cheeking feed, a fine turning feed, a dwell (during which the cutting tools are held in definite positions for five or six revolutions of the crankshaft in order to clean up the various cuts), a rapid traverse of the tools into the unloading position, and stopping.

After the operator has chucked a crankshaft, it is merely necessary to depress an electrical start button, which causes the machine to pass automatically through the entire work cycle. A stop accurately controls the work diameters. Most of the bearings are of the anti-friction type, with the exception of the main spindle bearings which are babbitt-lined bronze boxes. Force-feed lubrication is provided throughout the machine.

The particular lathe illustrated is set up for cheeking, turning, and filleting Nos. 1 and 4 crankpins on a heavy Diesel engine crankshaft. A bed of extra length was provided. This machine is driven by a 20-horsepower variable-speed direct-current motor, the power being transmitted through multiple V-belts. The weight of the machine is 28,000 pounds.



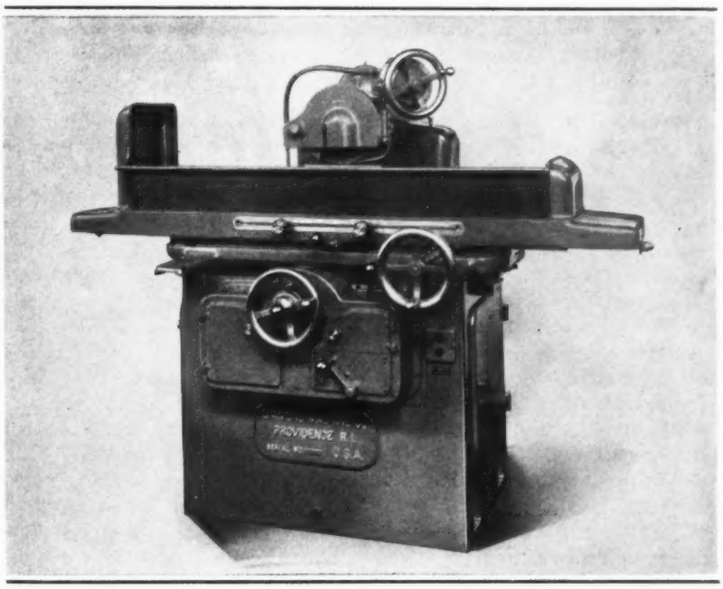
Wickes Automatic Duplex Type Lathe for Heavy Diesel-engine and Tractor Crankshafts

Diamond Surface Grinding Machine for Tool-Room and Production Work

Hydraulic longitudinal and cross feeds are provided on a surface grinding machine developed by the Diamond Machine Co., 9 Codding St., Providence, R. I. The longitudinal feeds are variable from 10 to 100 feet a minute and are instantly adjusted by means of a single lever. The cross-feed range is from 0 to 0.125 inch, and this feeding movement occurs at the end of each stroke. Provision is made for quickly disconnecting the hydraulic mechanism when sensitive hand operation of the table is desired.

This machine is driven by two motors of 1 1/2 horsepower, which run at 1800 revolutions per minute. One motor drives the main spindle at a constant speed, while the other drives the hydraulic mechanism. The machine is arranged for wet grinding, a water pump, removable sediment tank, and main tank being contained within the bed. Safety devices prevent hand and power longitudinal feeds from being engaged at the same time, as well as over-travel of the table.

The wheel-spindle is provided at the front with a tapered bronze bearing which can be adjusted to compensate for radial and longitudinal wear, so that the correct wheel position can be maintained. At the rear, the



Diamond Surface Grinding Machine with Hydraulic Longitudinal and Cross Feeds

spindle runs in a floating radial ball bearing. The wheel is mounted on a detachable sleeve.

This machine has capacity for grinding work up to 8 inches wide, 24 inches long, and 9 inches high, beneath a 10-inch abrasive wheel. The table travel is sufficient to enable the wheel to clear the table on all sides.

Reinecker Heavy-Duty Spline and Pinion Hobbing Machines

A line of Reinecker heavy-duty hobbing machines is being placed on the American market by the George Scherr Co., Inc., 128 Lafayette St., New York City, which have been so designed as to be adapted to a number of operations, thus being equally suitable for both large- and small-lot production. These machines can be used for hobbing straight- and spiral-spline shafts, spur and helical gears or pinions, and multiple threads. Some of these operations require a differential, which can be supplied. Single or multiple threads can also be milled by means of a special cutter-head and a single indexing attachment.

The machines can be furnished either as spline and pinion hobbers only, as thread millers only, or as a combination of both when universal machines are desired. They are built in three sizes as regards diameter and pitch capacities. Each size can be furnished in different lengths.

A heavy adjustable follow-rest supports the work close to the cutter to prevent chatter. Similarly, the cutter-arbor is rigidly supported by an adjustable bearing equipped with a taper bushing. Twelve cutter speeds are available through back-off gears and a sliding gear-box.

Power for rotating the work-head is derived from the cutter drive-shaft through index-gears, a worm, and index-wheel. For spiral-fluted work, a differential is interposed and connected to the cutter-slide feed. It is thus independent of the number of teeth being cut. To insure maximum accuracy, the dividing wheel is made of unusually large diameter. It is claimed that the total cumulative tooth errors are limited to less than 0.001 inch.

The cutter-head can be swiveled in the vertical plane by a worm and handwheel. Accurate settings are obtained through the use of a circular scale and vernier.

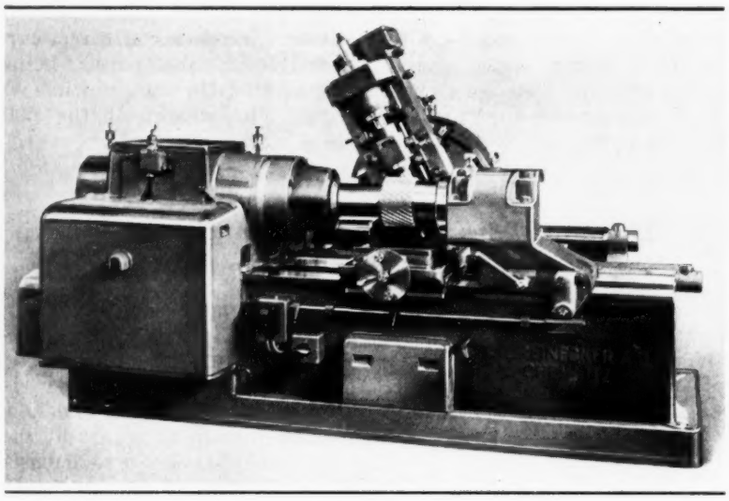


Fig. 1. Reinecker Machine for Hobbing Straight and Spiral Splines, Spur and Helical Gears, and Single or Multiple Threads

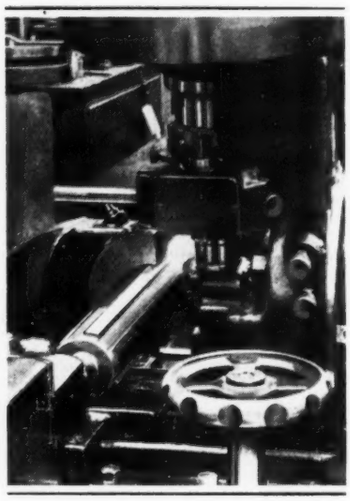


Fig. 2. Close-up of Straight-spline Milling Operation

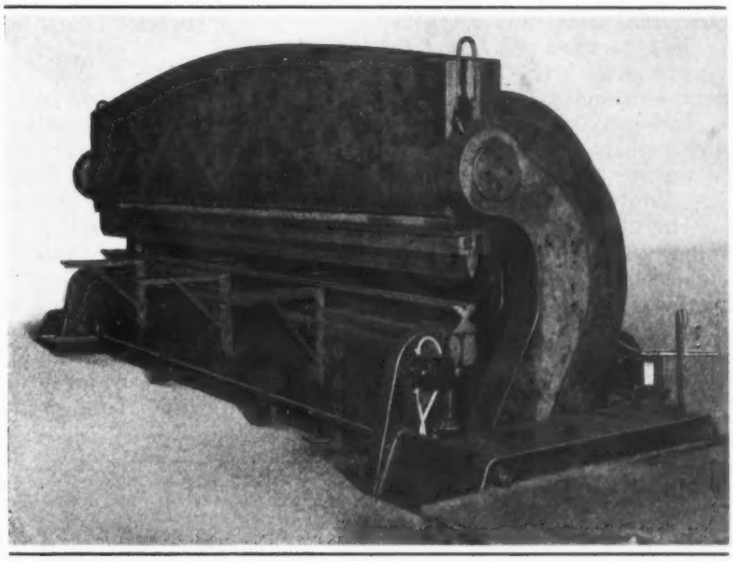
Protectoglo Combustion-Safeguard Equipment

An improved combustion-safeguard system, known as the "Protectoglo," which can be supplied for practically any type of burner equipment is being placed on the market by the Brown Instrument Co., Division of the Minneapolis-Honeywell Regulator Co., 4485 Wayne Ave., Philadelphia, Pa. This apparatus includes two separate types of relays and a flame-sensitive electrode which can also be used as a special spark plug for electric ignition. Standard primary controllers and motor valves complete the system.

This system is based on the principle that the electrical conductivity of a flame provides a means of safeguarding combustion. The relays contain thermionic tubes for rectifying and amplifying the power input which, when conducted from the electrode unit to a ground through the flame, operates the relay units that control the main fuel valve, etc. Any failure of the flame will cause an instantaneous shut-down.

Boom All-Welded Press Brake

A press brake of 500 tons capacity, capable of bending sheets up to 16 feet long, was recently constructed by the Boom Boiler & Welding Co., Main and Elm Sts., Cleveland, Ohio. One of the features of this press brake is that it pulls two leaves together, instead of merely pushing one leaf down. The bottom leaf is raised and lowered by a worm drive controlled through a switch on the front of the machine. Another feature that differs from conventional practice is that all the driving mechanism, adjustment shafts, etc., are located below the floor level. This leaves the entire top of the machine clear and eliminates possible danger of overhead breakage.



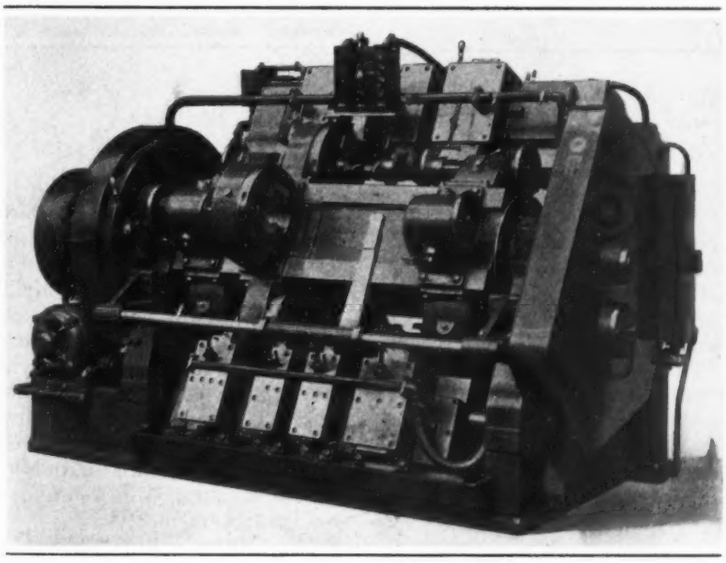
Press Brake Capable of Bending Sheets up to 16 Feet Long

The brake measures 24 feet 2 inches over all, 16 feet 1 inch between the housings, 7 feet in width, 10 feet in over-all height, and 6 feet 9 inches in height above the floor. The weight is 61 tons. The machine is constructed entirely of steel plates, arc-welded together with equipment supplied by the Lincoln Electric Co., Cleveland, Ohio. Power is furnished by a 30-horsepower motor. The press can be operated at either four or twenty strokes a minute. It has a two-ton flywheel.

Machines of the same type are built by the concern in a variety of sizes to meet requirements.

LeBlond Drum Type Crankshaft Lathe

An automatic four-station drum type lathe of the construction illustrated was recently built by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, for finish-turning all line, stub, and flange-end bearings of automobile crankshafts and for finishing the adjacent shoulders or faces. The revolving drum carries each crankshaft progressively from the loading station to three machining stations and back to the loading station. At each machining station, a relatively small amount of stock is removed from the various crankshaft surfaces, so as to hold to a minimum the strains set up in the cutting tools. The advantages claimed for this machine include a saving in time and spoiled work, as well as the production of more accurate crankshafts. One crankshaft is completed at each indexing of the drum.



Le Blond Drum Type Lathe which Automatically Carries Crankshafts through Three Machining Operations

Each crankshaft is placed between centers and located and clamped by a center driving chuck after it has been positioned endwise to suit a swinging gage mounted on the front of the machine. The driving chucks of the four drum stations are operated by a two-speed motor, so that the rotating speed of

each crankshaft can be reduced as the tools near the end of the cutting cycle. This control of the speed, together with the use of rubber-cushioned chucks, results in a high degree of finish on the work, free from chatter and vibration marks. Each driving chuck stops automatically as it reaches the loading station. A supplementary manual control is provided, by means of which the operator can rotate each driving chuck when it is in the loading position.

A hydraulic mechanism locks the drum after each indexing movement. The chucks are encircled by a yoke which clamps them hydraulically for the machining operations. This prevents twisting or weaving of the drum from the action of the cutting tools on the crankshafts. A device that is interlocked with the electrical system prevents indexing of the drum until the newly loaded crankshaft has been chucked and the operator has manipulated certain controls to make the machine repeat its working cycle. The production ranges between forty-five and fifty-five crankshafts an hour.

Peerless Double-Spindle Gear-Tooth Chamfering Machine

External gears up to 13 inches in diameter can be handled in a hydraulically operated gear-tooth chamfering machine of double spindle design, which has been added to the line built by the Cimatool Co., E. Third and June Sts., Dayton, Ohio. This machine operates at cutting speeds as high as 300 teeth a minute. It embodies the same flexibility with regard to shape of gear-tooth chamfer and roundness as the previous machines built by this concern, and it is based on the same mechanical principles. However, it permits the chamfering of two teeth simultaneously on the same gear, thus cutting the production time in half.

The machine is equipped with a new type anti-friction bearing work-head that provides the "Peerless" continuous indexing action in time with a forward and backward motion produced by a cam. The resulting rotary and longitudinal movement presents the gear teeth to the cutters in the manner required to obtain the desired shape of chamfer. The cutter-spindles are in a stationary position during the cutting. The machine utilizes inexpensive pencil type cutters which may be ground back until only the shanks remain. To facilitate loading and unloading, the cutter-spindles are moved out of the cutting position hydraulically.

All hydraulic controls are on the front of the machine. Easily removed cover plates provide immediate accessibility to the hydraulic and coolant pumps and motors. The work-head is located on a table which has a front to back movement. Rapid clamping is provided by hydraulic means.

The work-head is mounted on an inclined surface to provide for rapidly adjusting the work vertically above or below center. Power is transmitted to the work-head from an individual motor through V-belts and a gear-reduction unit.

The cutter-spindles have a swivel adjustment in horizontal and vertical planes. They have independent motor drives.

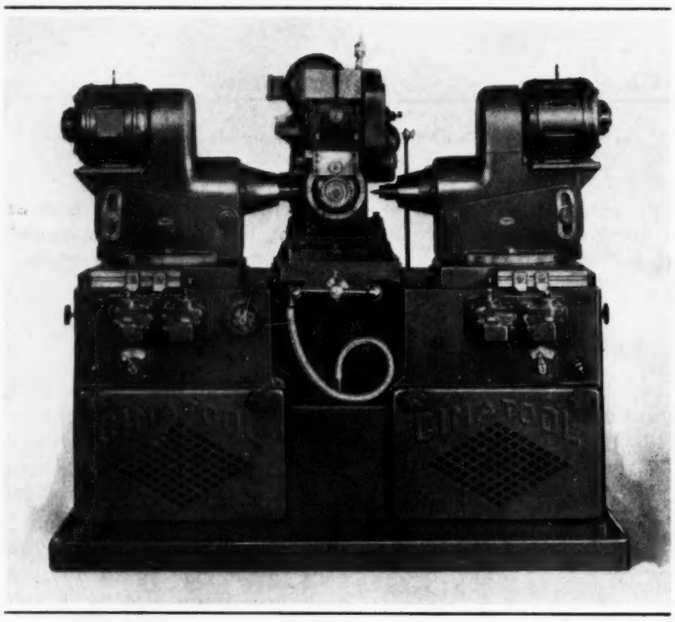


Fig. 1. Peerless Hydraulic Gear-tooth Chamfering Machine of Two-spindle Design

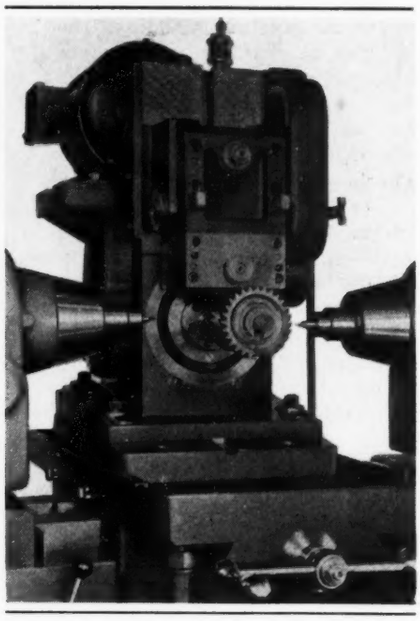
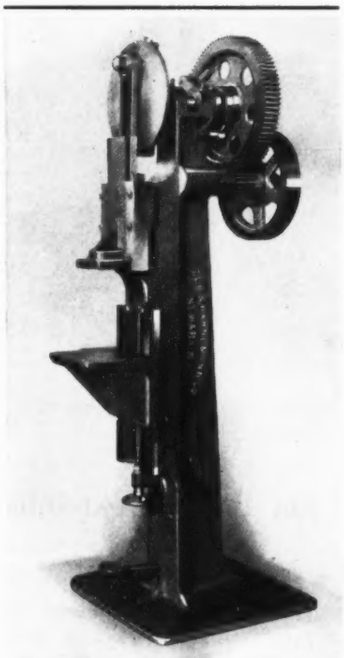


Fig. 2. Close-up View of Work-head and Cutters



Zeh & Hahnemann Variable-stroke Press

Zeh & Hahnemann Variable-Stroke Press

A press of comparatively light pressure, with a large variable stroke and an adjustable table, has been brought out by the Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J. When the adjustable table is in the lowest position and the stroke is adjusted to 10 inches, there is a die space of 8 inches. The range of table adjustment is 12 inches. The distance from the center of the press to the edge of the frame is 5 inches. The lower part of the slide can be made to suit special requirements or operating conditions, as specified by the customer.

This press can be furnished either plain or geared, and it can also be arranged for individual motor drive. The gear ratio is 1 to 6. The speed of the plain press is 100 revolutions per minute. A one-horsepower motor is required. The total weight is 900 pounds.

Langelier Drilling and Tapping Machines

The machine illustrated in Fig. 1 was recently built by the Langelier Mfg. Co., Providence, R. I., for drilling and tapping door-knob spindles. This machine is constructed with two standard automatic drilling units, mounted on a vertical column and driven by individual motors. The unit at the right is equipped with a six-spindle drill head, and that at the left with a six-spindle tapping head which is used in conjunction with a reversing mechanism. The drilling head spindles are gear driven and mounted on ball bearings. Adjustable collets permit setting the drills after grinding. The tapping head has spindles that recede in the event of drill breakage, thus protecting the tap.

The work is loaded into a vertical magazine and fed progressively to the drilling and tapping stations. The drilling unit controls the machine cycle through a cam which indexes the pieces. After the drilling head is started in motion, it operates a trip-dog on the tapping head to feed the taps through the work. Lubricant is directed to each tool by a motor-driven pump.

The fixture is adjustable for drilling and tapping four, five, or six holes in the door-knob spindles. However, the driving and tapping spindles in the multiple heads are located on fixed centers, and, therefore, the center distances between the holes in the work cannot be varied. A production of about 900 pieces an hour can be obtained with this machine.

The same concern has recently developed the bench type of machine shown in Fig. 2, which is designed for drilling seven holes simultaneously in novelty salt and pepper shakers. The parts are loaded one at a time into a V-block, mounted on a slide that is fed to the drills by the operator. The slide is returned to the starting position by a spring. Six of the holes are spaced around a circle 1/2 inch in diameter and the seventh hole is drilled in the center. The drills are 3/32 inch in diameter.

This type of machine is also being used for drilling vent holes in pistons installed in hydraulic shock absorbers.

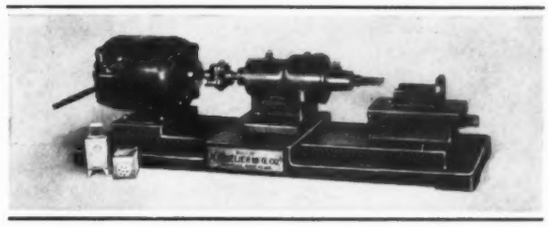


Fig. 2. Bench Machine which Drills Seven Holes to Close Center Distances

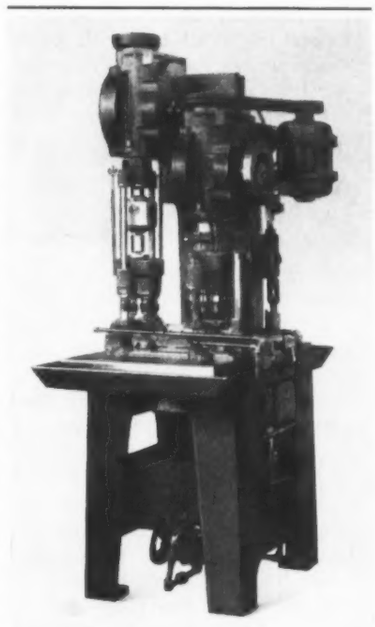


Fig. 1. Langelier Magazine-fed Drilling and Tapping Machine

G-M Photo-Electric Relay

A photo-electric relay housed in a small steel cabinet and fitted with a lens aperture for increasing the sensitivity of the outfit is now being made by G-M Laboratories, Inc.,

1731 Belmont Ave., Chicago, Ill. Models are available with 2- or 3-inch lenses, with rectangular apertures and no lenses, and also without an aperture for use with a separate tube housing.

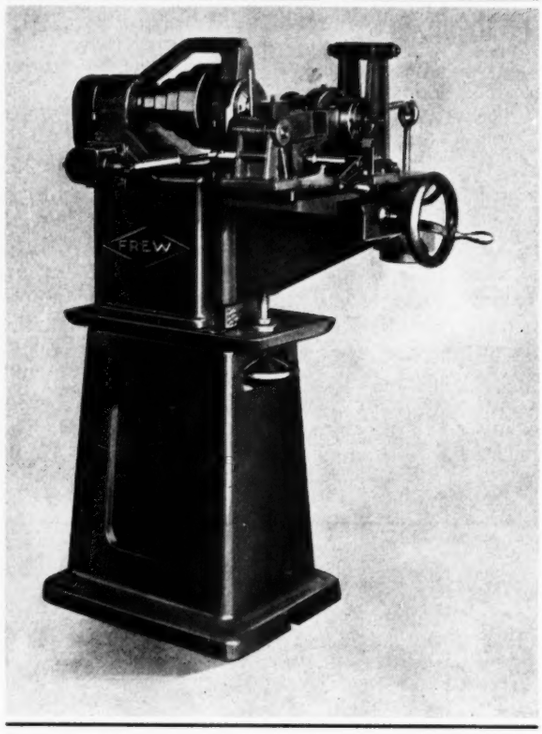
Visitron photo-electric tubes are used in this relay, which is designed for use with 110- and 120-volt, 50-60 cycle current, although it is also available for other voltages and frequencies.

Frew Cam Milling Machine

A cam milling machine designed for the production of both face and barrel cams has been brought out by the Frew Machine Co., 132 W. Venango St., Philadelphia, Pa. The cam contours are controlled by a master cam. Two fixtures are provided, either of which can be applied to the saddle of the machine, one being used for flat cams and the other for barrel or cylindrical cams. The drive for the fixtures is taken from the rear end of the spindle through pick-off change-gears which permits variations in the rate of cutter feed.

The flat cam fixture mounted on the saddle of the machine shown in the illustration is arranged to take the master form on the arbor at the front end of the machine. The work is bolted in place on the arbor at the other side of the fixture. As the arbor in the fixture revolves, the master rides against a former pin. The work is thus raised and lowered in accordance with the shape of the master cam, causing the cutter in the main spindle to cut a cam profile on the work which is a duplicate of that on the master cam. The arbor carrying the master and the work runs in bronze bearings and has a ball thrust bearing at the work end, which takes care of any cutter thrust. Provision is made for raising and lowering the knee. There is also an in and out adjustment on the saddle for controlling the depth of cut. Pressure of the master on the former pin is taken care of by means of weights attached to the end of the fixture arm.

The barrel cam fixture, which can be put on the machine in place of the flat cam fixture, is of the rolling type, in which the cutter follows the same path as that of the former pin in contact with the master cam. Both fixtures are driven by hardened steel worms meshing with bronze worm-gears which are split to provide adjustment for wear. The machine shown will mill cams up to 6 inches in diameter. A larger machine is also made for milling cams up to 12 inches.



Machine Developed by the Frew Machine Co. for Milling Face and Barrel Cams

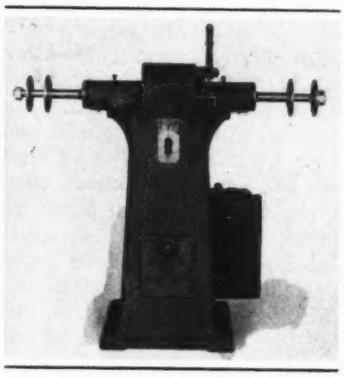
Lyon Hydraulic Lift-truck for Handling Large Stamping Dies

Lyon 15-Ton Hydraulic Lift-Truck

A 15-ton hydraulic lift-truck which is believed to have the greatest capacity of any hand lift-truck so far constructed has been built recently by the Lyon Iron Works, Greene, N. Y., for a plant producing automobile stampings. The truck is used for transporting dies to and from large stamping presses.

A handle is provided for pulling the truck by hand, and a towing hitch is included, so that it can be attached to a power truck. The elevating frame is raised by means of hydraulic rams, operated by a hand hydraulic pump. The carrying platform is 30 inches wide by 84 inches long; it has a lowered height of 9 1/4 inches and elevates 3 3/4 inches.

There are four wide-faced rear wheels—not shown in the illustration—and two front wheels, all equipped with extra large ball bearings. Easy turning is obtained by having large thrust and radial bearings in the wheel unit by which steering is accomplished. The truck is of electric-welded construction.



Selective-speed Polishing and Buffing Machine

Selective-Speed Polishing and Buffing Machine

A polishing and buffing machine which provides a selection of spindle speeds has been added to the line of machines made by the Standard Electrical Tool Co., 1948 W. Eighth St., Cincinnati, Ohio. This machine is made in 3, 5, 7 1/2, 10, 15, and 20 horsepower sizes. Any type of motor can be used, and a simple change in electrical equipment permits changing from a direct-current to an alternating-current motor at any time.

A hand brake for stopping the spindle and a shaft-locking device are features that enable the polishing and buffing wheels to be changed quickly. Power is transmitted to the spindle by four cog type V-belts. An elevating screw provides means for adjusting the tension on the belts. The entire spindle can be removed for replacing the belts, when necessary, without disturbing the ball bearings.

Dreses Multi-Duty Horizontal Drilling and Milling Machine

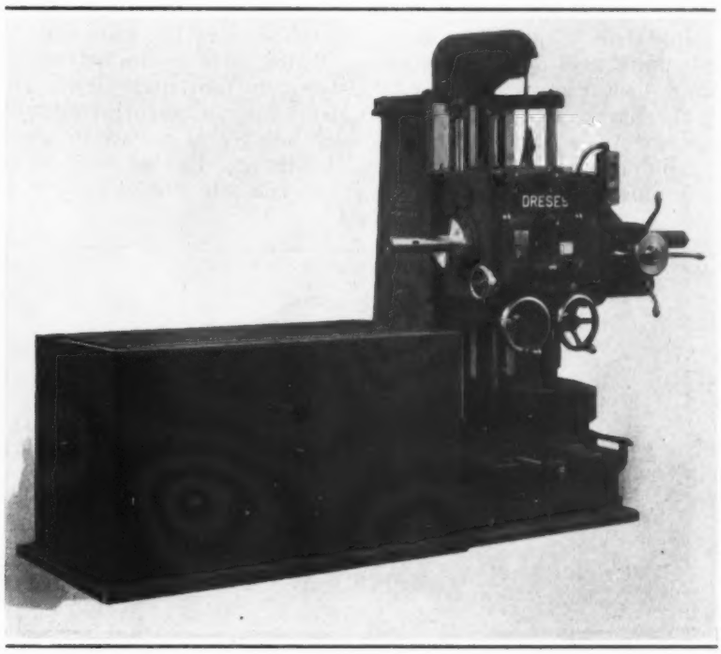
A stationary table type horizontal drilling and milling machine which can be furnished in various table sizes has recently been added to the line of machines made by the Dreses Machine Tool Co., Cincinnati, Ohio. This machine is being placed on the market through the Bryant Machinery & Engineering Co., 400 W. Madison St., Chicago, Ill. The machine consists of a stationary table, a milling and drilling head, and a column and column runway, as shown in the illustration.

The entire control of the machine is located on the head. This includes all of the feed and speed changes, feed reverse, milling feed control, and the starting, stopping, and reversing of the driving motor. The control is so arranged that it is impossible for two speeds, two feeds, or the feeds to the head, column, or spindle to be thrown in at one time. A series of three handwheels, together with dials reading to 0.001 inch, are furnished for the hand feed to the spindle, the vertical feed to the head, and the horizontal feed to the column.

The spindle head is fully counterbalanced, with the counterweights located inside of the column. The head contains the entire driving mechanism for the spindle, the feed-change unit for the drilling and boring feeds to the spindle, and the milling feeds to the head and column. The feeds to the head and column are through large single-pitch screws having feed-nuts of the revolving type. The drilling and boring feeds to the spindle are obtained through a multiple-disk friction clutch and worm-gears which drive a rack cut from the solid spindle-feeding quill.

The entire mechanism of the head is lubricated from a circulatory system consisting of a positively driven pump, Purolator, and the necessary piping. The table contains a tank for the cutter coolant system. The top of the table is machined its entire width and length, and contains planed T-slots and the oil trough. The cutter coolant system consists of a pump and electric motor mounted on the table to the rear of the machine.

A machine of this type having a spindle 3 or 3 1/2 inches in diameter, with a continuous spindle feed of 18 inches, a ver-



Horizontal Drilling and Milling Machine Developed by the Dreses Machine Tool Co.

tical travel of the spindle head of 24 inches, a horizontal travel of the column of 24 inches, and a table 30 by 60 inches, weighs approximately 14,000 pounds. Twelve spindle speeds ranging from 15 to 500 or from 30 to 1000 revolutions per minute are available. Eight feeds are provided for drilling and boring and for the milling feeds to the head and column.

W. F. & John Barnes Square-Ram Hydraulic Unit

A smaller size, known as the SR-2, has been added to the line of square-ram hydraulic units developed by the W. F. & John Barnes Co., Rockford, Ill., several years ago. The new unit follows the same line of design as the larger sizes, but several marked improvements have been introduced. The new size will broaden the field of application of the square-ram hydraulic units to include smaller drilling, boring, reaming, and similar operations performed at high speeds.

A V-belt drive conveys power from the motor to the spindle, with the spindle speeds governed by V-belt sheaves. This unit has only two gears, used for driving the hydraulic pumps. They are of the Cone worm type, insuring unusually quiet running, even though much higher speeds are feasible than in the larger sizes. The pumps used are of the company's own design, incorporating the Barnes hydraulic circuit and providing an automatic cycle of rapid approach with one or more feed rates; controlled dwell; and quick return. Reverse feed can also be provided if required.

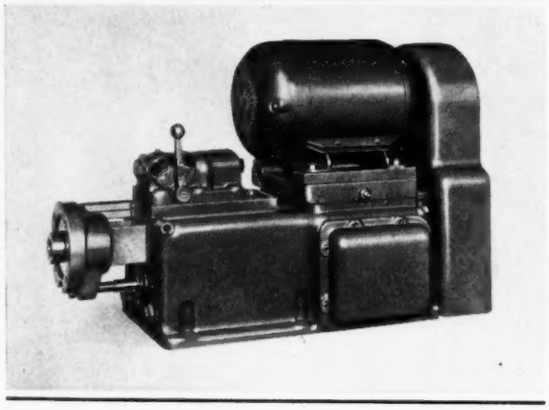
The square ram, which cannot twist or turn, is provided with an integral flange for multiple-head mounting. The unit is solenoid-operated, and is entirely automatic through the interrelated arrangement of valve, solenoid, and limit switch. Piping is practically eliminated, there being only two short pipes which are entirely enclosed within the structure. All other hydraulic connections are manifolded. The unit can be incorporated in new machines or applied to machines already installed. It can be mounted in any required position, and may be provided with an independent or centralized control.

Manifold Valve for Controlling Pneumatic or Hydraulic Equipment

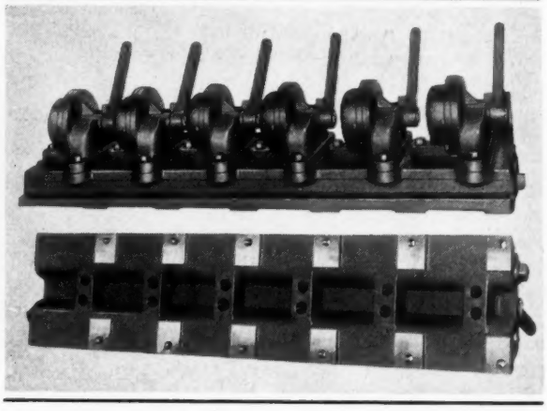
An improved "packless" manifold type air control valve of compact construction, arranged for simple piping installation, has been brought out by the Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill. The valve illustrated is used for controlling six double-acting air cylinders. Other types are available for controlling any number of air or hydraulic cylinders.

The base of the valve is in one piece, with the inlet and exhaust ports at the ends and the cylinder ports in the bottom, as shown by the lower view. The manifolds can be furnished with any number of valves required. The bronze disk of each valve that controls the air flow is ground and lapped to make a tight seal with the seat, which is similarly finished. The efficiency of the disk and valve seat can be maintained by simply relapping at infrequent intervals.

The valves are available in three-way and four-way types. One type has a 45-degree movement, with no shut-off position, air being admitted at all times to one side or the other of the air cylinder. Another type has a 90-degree movement with outlets open to exhaust when the lever is in the shut-off position. Still another type of valve has a 90-degree movement with both the outlet and exhaust ports closed when the lever is in the shut-off position.



Smaller Size of Barnes Square-ram Hydraulic Unit Adapted for Multiple-head Mounting



Multiple Valve Unit for Controlling Operation of Air or Hydraulic Cylinders

Deep-Throat "Do-All" Machine

A machine with a throat 18 inches deep has been added to the line of "Do-All" machines

Fig. 1. Band-Sawing, Filing and Polishing Machine with Deep Throat

built by the Continental Machine Specialties, Inc., 1301 S. Washington Ave., Minneapolis, Minn., for sawing, filing, and polishing operations. The work-table of this machine, which is shown in Fig. 1, is 21 inches square. An extra idler pulley mounted on the deep frame of the machine carries the saw, file, or abrasive band sufficiently toward the rear to permit the machine to be constructed with a deep throat. In other respects, this machine is similar to the standard model described in November, 1935, MACHINERY, page 224, which is made with a throat depth of 12 inches.

The equipment includes an automatic electric saw-brazer which contains a grinding device driven by a separate 1/4-horsepower motor. There is also a welding transformer unit. Band speeds from 75 to 450 feet a minute are instantly available through a gear transmission unit. There is an automatic power feed for the work, by means of which any desired pressure can be obtained. An air pump in the base provides a jet of air at the work, while a baffle and tube carry chips and filings out at the back of the machine.

The same concern has also recently brought out the bench type machine shown in Fig. 2, which is intended primarily for use in the smaller shops. This bench model uses the same file bands, emery-cloth bands, and band saws as the larger machines. It is not equipped with the automatic electric brazer, but is furnished with a convenient jig and complete equipment for brazing band saws to permit internal sawing operations. A braze can be made in ten minutes. This machine operates at one speed only—140 feet a minute. It is driven by a 1/3-horsepower motor.

Conway Heavy-Duty Gear-Tooth Drive Clutch

The Conway Clutch Co., 1534 Queen City Ave., Cincinnati, Ohio, has developed a heavy-duty gear-tooth drive clutch especially designed for drives in which backlash occurs, as in oil-field pumps and steel-mill and paper-mill drives. In general, this type of clutch is applicable where there is a "reciprocal" load or action. The capacity ranges from 13 to 180 horsepower at 100 revolutions per minute.

The main feature of the clutch is its compact construction and the under-slung position of the actuating levers, whereby the clutch plates are squeezed, rather than pushed, together. These levers are operated through a toggle linkage from the ball-bearing mounted shifter collar. When the clutch is disengaged, this construction causes the centrifugal force to aid, rather than retard, rapid disengagement, a feature that is due to the position of the actuating levers and the manner in which they are fulcrumed. The contact surfaces of the levers and the hardened contact surfaces on the clutch disk have been increased 50 per cent in area to prevent wear.

The actual friction-clutch surfaces are of cast iron, bearing against asbestos. The cast-iron plates are exceptionally thick, so that they will absorb and disseminate the heat generated. The middle plate is ventilated, as may be noted from the slots seen in the illustration.

The toothed annular adjustment ring is placed near the outside of the clutch for two reasons—finer adjustments and greater accessibility.

Extended sleeves are bolted to the adapter and may be furnished in practically any diameter and length for use with bronze or anti-friction bearings.

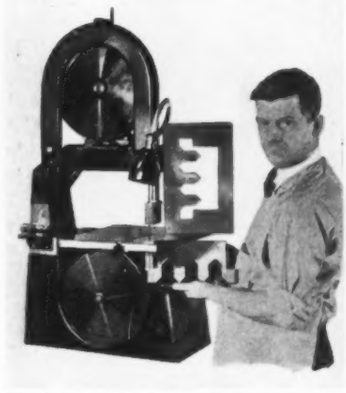
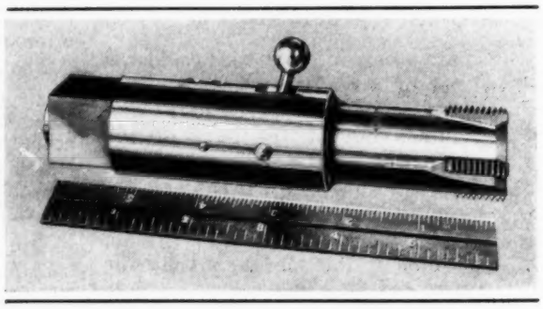


Fig. 2. Bench Type of "Do-All" Machine

Conway Heavy-duty Clutch with Adapter Casing Removed

Landis Collapsible Hand Tap

An improved hand sizing tap has been added to the line of collapsible taps manufactured by the Landis Machine Co., Inc., Waynesboro, Pa. The illustration shows a 1 3/8-inch size, with an over-all length of only 6 inches. There is a trigger on the side of the tap body for unlatching and collapsing the chasers. The chasers are reset by pressing against a plunger that extends slightly from the shank.



Landis Collapsible Hand Sizing Tap with Self-locking Adjustment

The new tap was designed primarily to take the place of the solid adjustable tap ordinarily used in sizing. It provides the advantage of instantly withdrawing the tap from the work without the necessity of backing it out. It eliminates tearing of the threads and wear of the radial clearance on the chasers, which frequently occur when taps are backed out. The tapping time is considerably reduced.

This tap has a diametral adjustment of approximately 1/32 inch both over and under the nominal chaser size, making a total adjustment of 1/16 inch. The adjusting screw is in the front end of the tap. It is of the ratchet type and is therefore self-locking to maintain the size. A turn of one notch in the ratchet adjustment gives a diametral movement of the chasers amounting to 0.001 inch. This collapsible hand tap can be furnished in all sizes from 1 3/8 to 12 inches, inclusive.

Coolant Pump with New Type of Internal Discharge

Ruthman Gusher Machine Tool Coolant Pump

A machine tool coolant pump with a new type of internal discharge has been brought out by the Ruthman Machinery Co., Cincinnati, Ohio. This pump is of the regular gusher coolant pump line built by the company, having independent twin-suction intake and hydrostatic balance features. It differs, however, from earlier designs in that it is provided with a bracket that is mounted directly on the coolant tank or reservoir and has the discharge pipe connected inside of the reservoir, from where it is led to any part of the machine internally or externally as required.

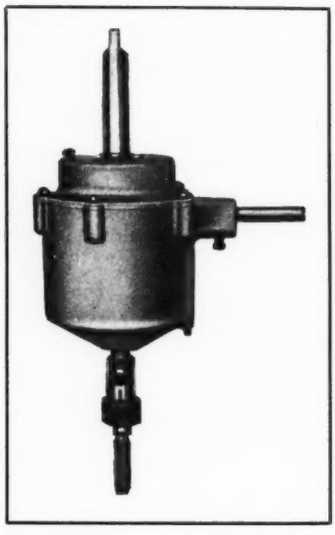
The primary object of the new design is to simplify the installation, since all that is required for the pump connection is a pad with holes for four screws and a 3-inch hole in the center of the pad which provides for both the intake flow and the discharge connection. By loosening six capscrews between the stem housing and the impeller housing the entire pump can be removed, leaving the casting connection with the reservoir in place. With this construction, there is no need to specify right- or left-hand discharge, because no independent opening need be provided for the discharge pipe.

This type of pump is made in two lengths, the distance from the center of the intake to the maximum water or coolant level being 8 3/8 and 4 3/8 inches, respectively.

The regular features of these pumps—no metal-to-metal contact, freedom from packing glands or their equivalent, and full ball-bearing construction—are retained.

Procunier High-Speed Tapping Attachment

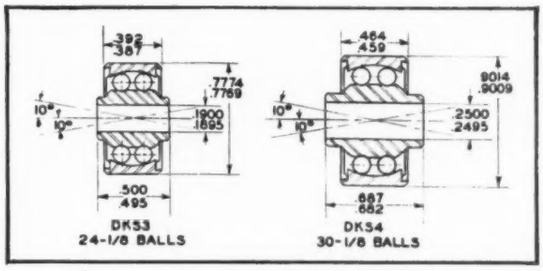
A high-speed friction tapping attachment, equipped with a new type of tap-holder known as the "True-Grip," that is claimed to increase tapping accuracy con-



Tapping Attachment Made by Procunier Safety Chuck Co.

siderably, has recently been brought out by the Procunier Safety Chuck Co., 16 S. Clinton St., Chicago, Ill. The extreme lightness of this holder, which weighs only 2 1/2 ounces, including the spring collet and chuck spindle, serves to reduce the flywheel effect to the minimum. The largest diameter is only 3/4 inch, which permits precision tapping very close to a shoulder and also provides a clearer view of the work. Other advantages claimed for the new holder are less tap breakage, greater sensitivity, less wear on the tapping attachment mechanism, and no protruding parts to catch the operator's clothing.

The tapping attachment mechanism is enclosed in an aluminum housing. The reversing mechanism is of the planetary type, employing heat-treated gears. A double-cone, cork-faced friction clutch provides a powerful, yet sensitive friction drive forward and reverse. The special cork facing is cemented to the hub of the clutch and is practically indestructible. With this arrangement, bottom tapping can be accomplished as easily as through tapping. This new attachment has a capacity for taps ranging in size from No. 2 to 3/16 inch in steel and 1/4 inch in brass and cast iron.



Two Sizes of Self-aligning Bearings Recently Brought out by the Fafnir Bearing Co.

Fafnir Self-Aligning Bearing with Double Shields

Ball bearings having the features of internal self-alignment and double grease-shield protection have been added to the lines of the Fafnir Bearing Co., New Britain, Conn. Although developed primarily to meet requirements of the aircraft industry, these bearings are suitable for other industrial applications. They are of the double-row type, with the two rows of balls operating on a spherical race in the outer ring. This arrangement provides inherent self-alignment for shaft misalignment up to 10 degrees. The double metal shields are joined to the outer ring and maintain a very small but constant clearance with the inner ring.

These units are supplied pre-packed with lubricant. The rings are cadmium-plated on their exposed surfaces to protect them from corrosion. Two bearings of this type, having dimensions as shown in the illustration, are now available. These bearings have static radial capacities of 900 and 1100 pounds, respectively, and thrust capacities of 190 and 240 pounds.

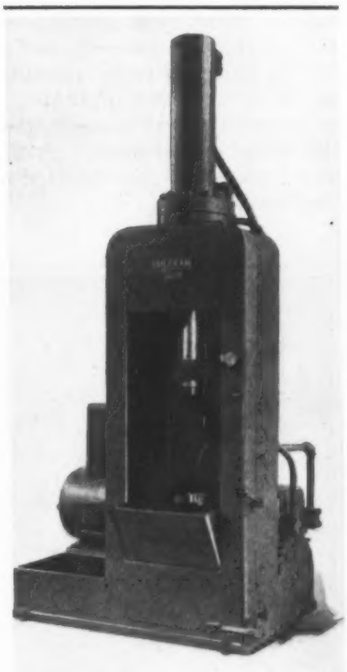
Oilgear 35-Ton Two-Column Press

A vertical press that is equipped for broaching rear-axle housing tubes, but can be easily adapted for other broaching, assembling, straightening, and general manufacturing purposes has been developed by the Oilgear Co., 1310 W. Bruce St., Milwaukee, Wis. In broaching rear-axle tubes, the work is located in the fixture on the base and back wall of the press. The broach, which is 1 11/16 inches in diameter, is put in place and the hand-lever or foot-pedal is depressed, causing the ram to move down and the lubricant to flow on the tool and work.

When the end of the tube is broached, the tool drops to the base, the ram returns automatically to the starting position, and the flow of lubricant stops. The finished piece is then removed and a new piece put in its place. All chips are flushed from the fixture and base into a collecting chamber and basket on the side of the press.

The press is of heavy ribbed construction, with the members welded into one solid unit. Fluid power operation is provided by an Oilgear variable-delivery two-way pump, direct connected to a 30-horsepower electric motor having a speed of 900 revolutions per minute. The hydraulic equipment provides smooth and positive control over the movement of the press ram. Reservoirs for both the variable delivery and the lubricant pumps are built into the rear of the press base.

The normal capacity of the press is 35 tons, and the peak loading capacity 48 tons. The ram has a stroke of 30 inches, and the "daylight" height is 60



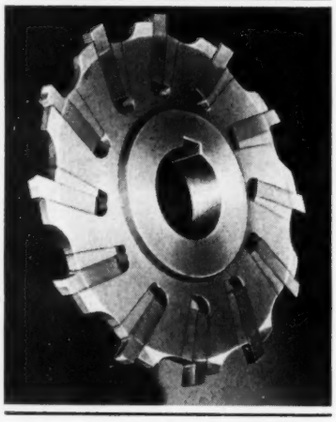
Press Made by the Oilgear Co. for Broaching Rear-axle Housings

inches. The downward speed is adjustable up to a maximum of 15 feet per minute, while the return speed can be adjusted up to a maximum of 30 feet per minute. The press has a net weight of 9600 pounds.

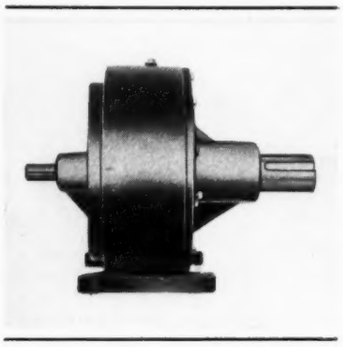
Ingersoll Tri-Lock Cutter for Keyway Milling

To meet the demand for inserted-blade cutters adapted for milling narrow keyways or slots, the Ingersoll Milling Machine Co., Rockford, Ill., has developed the "Tri-lock" cutter blade here illustrated. Three sets of serrations are incorporated in the blade and wedge. The horizontal serrations permit adjustments to compensate for wear on the cutting ends of the blades, so that the cutter diameter can be maintained. The vertical serrations permit sidewise adjustment of the blades to maintain the required width of cut. The double set of vertical serrations in the wedge serve to lock the cutter blade securely against movement in any direction.

Cutters having a width as small as 3/16 inch can be made with Tri-lock inserted blades. Cutters constructed as described permit a single set of blades to be resized many times. They also have the advantage that a single blade can be replaced if necessary.



Ingersoll "Tri-lock" Cutter Blade for Cutting Narrow Keyways



Smith Speed Reducer of Planetary Type

Smith Planetary Speed Reducers

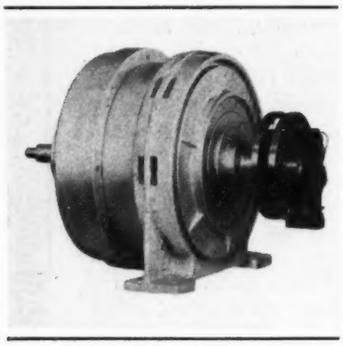
Planetary speed reducers have been added to the line of Winfield H. Smith, Inc., 116 Eaton St., Springville, Erie County, N. Y. The new line is said to be especially suitable for installations that require large reduction ratios. Any ratio from 20 to 1 upward can be provided.

Compactness and high efficiency are other advantages claimed for this unit. Anti-friction bearings are used throughout. Helical heat-treated alloy steel gears insure quiet operation and long life.

Limit Switch Operated by One-Half Ounce Pressure

A pilot limit switch weighing only one ounce has been brought out by the Production Instrument Co., 1325 S. Wabash Ave., Chicago, Ill. This switch is enclosed in a Bakelite case measuring 1 5/8 by 1 1/8 by 5/8 inches, and is adapted for operating electric counters and for the mechanical control of motor circuits, etc. It is shown approximately full size in the illustration. A pressure of 1/2 ounce on the operating arm is sufficient to actuate the switch, which has a rating of 1/2 ampere alternating current or 1/4 ampere direct current on inductive, resistance, or lamp loads.

This switch is of unusually simple design, there being but six parts, aside from the case.

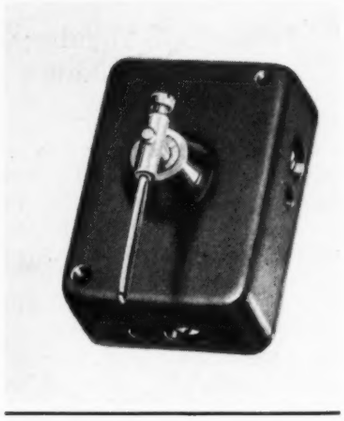


Magnetic Combined Clutch and Brake

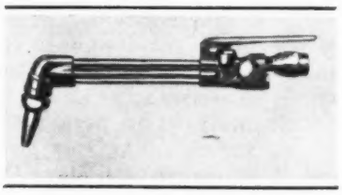
Magnetic Clutch-Brake

A magnetically operated combination clutch and brake that is particularly suited for application to large machine tools, power presses, bulldozers, rubber and paper making machinery, and similar equipment has recently been brought out by the Magnetic Mfg. Co., Milwaukee, Wis. It is approximately 24 inches in diameter, and develops a clutch torque of 4500 pound-feet and a brake torque of 1500 pound-feet.

This unit provides a means of starting and stopping automatically through an electrical control. Whenever the electric circuit is opened, the brake is mechanically actuated through springs to stop the drive quickly and without producing undue shock or stresses.



Pilot Limit Switch Made by the Production Instrument Co.



Oxweld Cutting Attachment of Recent Design

Oxy-Acetylene Cutting Attachment

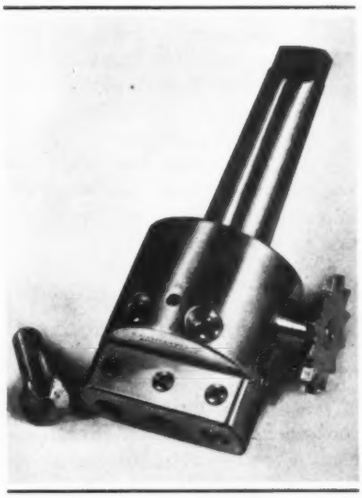
An oxy-acetylene cutting attachment known as the Oxweld Type CW-22 has been brought out by the Linde Air Products Co., 30 E. 42nd St., New York City. This new cutting attachment is designed to handle light sheet metal, and all but the heaviest work, at speeds equal to those of the full-size cutting blowpipe.

The attachment operates on low-pressure or medium-pressure acetylene, and can be used on either the Oxweld Type W-17 or W-22 welding blowpipe handle. The body and head of the attachment are designed to combine strength and lightness, the body being of pressure-forged bronze, while the head is a manganese bronze forging.

Cooke Micro-Slotted Nut

A nut that can be locked in from ten to twenty-two different positions per complete revolution is being placed on the market by the Blatchford Corporation, 86 E. Jackson Blvd., Chicago, Ill. This close adjustment is made possible by providing a series of slots that form keying wedges, as seen in the illustration. The wedges are placed off center in relation to each other, so that two keying positions are possible for each slot. The adjustment varies from 0.008 to 0.013 inch, depending upon the size of the nut.

Slotted Nut which can be Keyed in a Large Number of Positions



Craley Tool-head for Boring, Turning, and Facing Work up to 20 Inches in Diameter

Craley Boring, Turning, and Facing Head

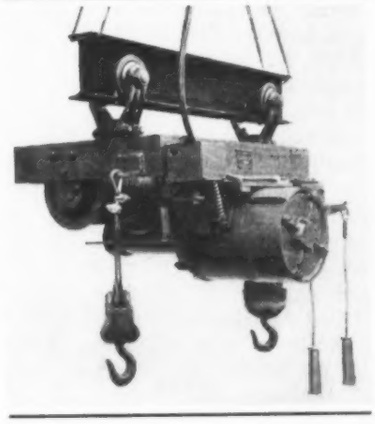
An all-steel heavy-duty boring, turning, and facing head for work up to 20 inches in diameter has been brought out by the C. C. Craley Mfg. Co., P. O. Box 192, Shillington, Pa. This tool is similar to the smaller boring head made by this company, which was described in January, 1935, MACHINERY, page 321. It is designed for use on boring, drilling, and milling machines. The illustration shows the head equipped with the star-wheel feed-screw used in performing such operations as facing and under-cutting. A tripping device is provided for turning or adjusting the star-wheel one or two points at each revolution of the spindle. The feed can be started or stopped instantly by a spring-tension plunger.

When the head is used for boring and turning, the graduated dial screw shown in the lower left-hand corner of the illustration replaces the star feed-screw. The tool-carrying block and dovetail bearing are of hardened tool steel and there are four holes 1 1/8 inches in diameter for the boring-bars. Three of these holes are arranged in the face of the block, while the fourth is located crosswise of the block. The tool-block is 6 inches long, 2 1/2 inches wide and 3 1/4 inches high. It has a travel of 2 1/2 inches, or 1 1/4 inches to the right or left of the center position.

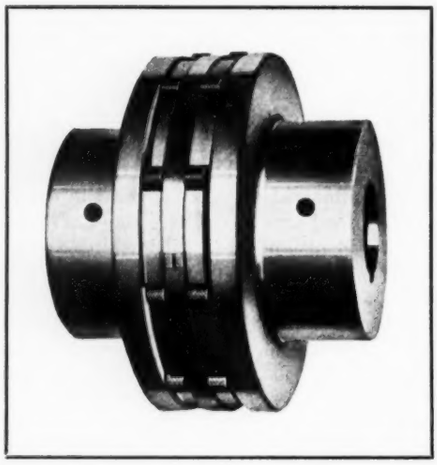
Twin-Hook Monorail Hoist

A twin-hook monorail electric hoist adapted for use in the automobile and machine-building industries for handling long machine parts, automobile bodies, and other bulky loads has been developed by Electro Lift, Inc., 30 Church St., New York City. This hoist is built in capacities of from 1/4 to 3 tons. It is equipped with two hooks for lifting the load from two points and is designed to carry the load without twisting.

The hoist cables are carried on



Twin-hook Monorail Hoist Made by Electro Lift, Inc.



Lovejoy Coupling with Free-floating Cushions

two drums, spaced to suit requirements, and operated through a single shaft by a worm-geared hoist unit. The entire unit is mounted on a welded-steel frame. The worm drive is equipped with Timken tapered roller bearings which operate in a bath of oil. The control may be of the rope type, operated by pulling cords, or of the push-button type.

Lovejoy Non-Lubricated Heavy-Duty Flexible Coupling

A new type of non-lubricated heavy-duty flexible coupling, designated as L-R Type W, is being manufactured by the Lovejoy Tool Works, 5021 W. Lake St., Chicago, Ill. This coupling is provided with individual load cushions which are free floating between the metal jaws. The cushions rest upon the central hub, being held in place by a spiral spring. They are free to adjust themselves instantly to any position of the jaws.

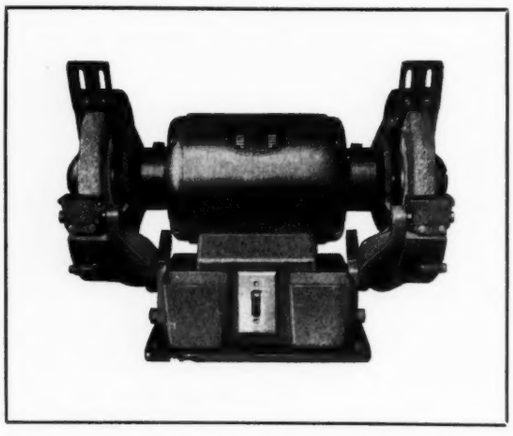
Owing to the improved method of retaining the free-floating load cushions, larger hubs and greater load-carrying surfaces are possible than in previous designs, and consequently the coupling has increased load carrying capacity. The load cushions can be quickly replaced when necessary. As there are no metal-to-metal contacts, these couplings are said to have an unlimited life.

In operation, one-half of the cushions are idlers (except on reversing loads), so that there is always a set of new cushions in the coupling. This feature eliminates lengthy shut-downs, as the load cushions can be replaced when machines are not in operation. Three types of resilient cushioning materials are available.

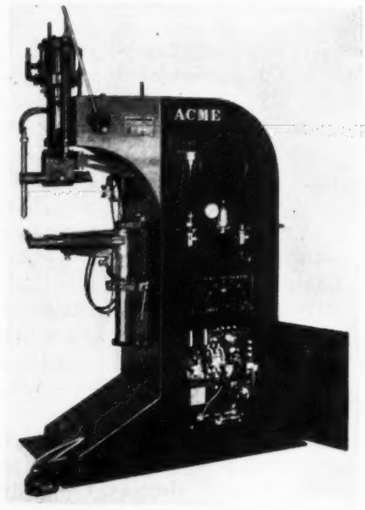
Marathon Grinding and Buffing Machines

The line of grinding and buffing machines made by the Marathon Electric Mfg. Corporation, Wausau, Wis., has recently been enlarged by the addition of machines of 3/4 and 1 horsepower. These machines are available for operation on single-phase and three-phase alternating current and direct current.

They are designed for rugged service and are provided with exceptionally heavy guards which meet all safety code requirements. These guards can be easily dismantled to facilitate wheel replacements. The tool-rest is designed to permit the use of wheels of various sizes and at the same time allow the tool-rest to be set for any desired grinding angle. The grinders are furnished with or without pedestals.



Marathon Grinding and Buffing Machine



Acme Welder Capable of Making 100 Spot Welds a Minute

Acme Spot-Welders

Two new series of air-operated, automatic, time-controlled spot-welders have been added to the line of equipment made by the Acme Electric Welder Co., Huntington Park, Calif. These welders are fabricated of heavy battleship steel. Automatic controls insure uniform welds, regardless of variations in the electrodes, the material, or the voltage.

A removable handle permits aligning the electrodes manually for initial set-ups. An indicator is provided which shows the amount of water flowing through the electrodes. All enclosed steel parts are cadmium-plated.